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Vol. XVI. Part 10. *OCTOBER 2, 1905.*

. . THE . .

AGRICULTURAL GAZETTE

. OF . .

NEW SOUTH WALES.

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4th June, 1894.

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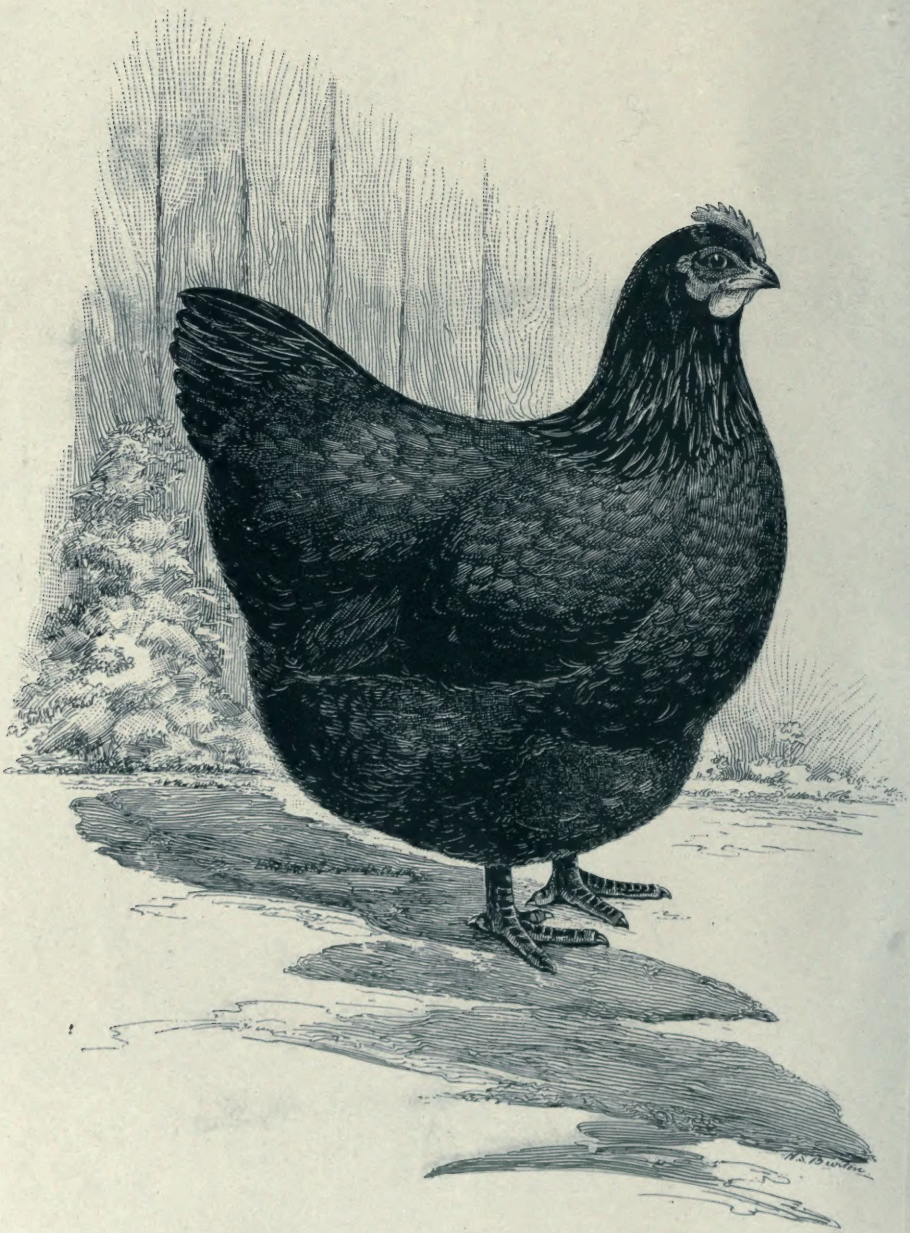


TYPICAL BLACK ORPINGTON.

VOL. XVI. PART 10. OCTOBER 2, 1905.

Agricultural Gazette of New South Wales.

Farmers' Fowls.

[Continued from page 878.]

G. BRADSHAW.

CHAPTER XVI.

ORPINGTONS.

Shows, &c.

IN connection with the good qualities of the old breeds, and the admitted deterioration, through over-showing or other causes, the opinions of the late Mr. Comyns are worth reproducing. Mr. Comyns was an exhibitor, reporter, judge, lecturer, &c., and for several years Secretary of the English Poultry Club (was my own nominator for membership of that club in 1884, a coincidence being that the late Mr. W. Cook, the man who made the Orpington, was also nominated at the same meeting). In fact, Mr. Comyns occupied every honourable position which the fanciers' poultry world of late years offered, and was of all others competent to speak of its results. In 1886 Mr. Comyns was engaged to deliver a series of lectures on poultry-keeping, under the auspices of the Institute of Agriculture, at the Museum of Geology, London, and, though editor of a fanciers' paper, pluckily introduced the subject as follows :—

"Throughout France poultry are almost universally kept for one of two purposes, either to lay eggs, or to fatten for the table. In England, on the other hand, a very large proportion of the poultry are not kept for either of these purposes, but to gratify the taste or 'fancy' of their owners. It is here, I think, that one of the gravest causes of want of success in poultry-keeping in England is to be found. There are no statistics of poultry-keeping in England available, but I hardly think I am beyond the mark in saying that more than one-half of the poultry of this country are either themselves fancy birds or immediately descended from such. Some of my readers know perfectly well what I mean by fancy birds, but, as I am here to instruct those who do not know, I will explain my meaning.

"In this country there are some hundreds of poultry shows in the course of the year, where prizes are offered for the various breeds. At these shows the birds are judged according to certain standards, which have in the course of time come to be accepted as the ideal of perfection of each breed. You will understand this better later on, when I come to describe the points of various breeds, but I may say here that these points of perfection are, as a rule, arbitrary and useless in themselves, from a practical point of view, as could well be imagined. Feathers—laced, pencilled, spangled, barred, striped, &c.;

combs—single, double, triple, rose, horned, and several other sorts; legs—feathered, bare of feather, yellow, black, blue, green, white.

"All these points have their value, and no slight value, in the estimation of the fancier. I have been a fancier, and have found it a most engrossing occupation or amusement; and I do not for a moment mean to say a word against fanciers as such. They have undoubtedly in some respects benefited the poultry-keepers in the country, but it is manifest that their pursuit in itself is of as little practical utility as would be the desire of a dairy farmer to produce cows with their horns twisted three times round, or some other similar arbitrary point not in itself an indication of purity of race. As an amusement, or as a pursuit from which money may be made, poultry-fancying is desirable and beneficial; but it is manifest that in the pursuit of all these fancy points the useful is sure to be lost sight of. What is necessary for the practical poultry-keeper is a breed of fowl which lays the largest number of eggs in the shortest possible time, and which will fatten readily and be of good quality on the table. The poultry-fancier, in the pursuit of his lacing, pencilling, &c., is obliged to make such a trivial matter as laying a very secondary consideration."

Mr. Tegetmeier, F.Z.S., editor of *The Field*, and author of "Profitable Poultry" and other works on this subject, and a judge of table poultry at most of the leading English shows, says:—"I have seen with regret the steadily increasing tendency of poultry shows to encourage mere fancy varieties, and to ignore altogether the profitable value of the birds exhibited. This has gone on to such an extent that I do not hesitate to affirm, as the result of my experience of half a century, that no one breed of fowls has been taken in hand by the fancier that has not been seriously depreciated as a useful variety of poultry. Further, what I object to is that fancy poultry should, in this country at least, take the place of useful birds that are fitted to supply the markets with poultry and eggs, for, as at present conducted, fancy points only have to be considered by the judges, the result being that the economical value of many breeds has been entirely lost. For example, Spanish, from being abundant producers of large white eggs, have become very indifferent layers, some of the notorious prize winners being sterile. Cochins on their introduction were good layers, and are now the worst. Dorkings, that formerly supplied the best fowls for London markets, are now bred as show-birds, and are not equal to Surreys. Game, formerly bred for table fowls, are now elongated out of all knowledge, and look more like the waders of the ornithologist. I wish to show that for economical purposes it is absolutely necessary that such views should be set forth, for at the present time our agricultural societies are doing what I conceive to be considerable injury by giving prizes for useless birds, and ignoring to a great extent breeds that would be of benefit to the farmer and the nation at large."

Mr. Edward Brown, a well-known English expert, whose specialty is table poultry, commenting upon the difference between the English and French show systems, says:—"English fanciers' shows are not established for the improvement of poultry in their economic

qualities, but for fancy points. The judge regards as all important shape, size, colour, comb, legs, and general contour, and does not care whether the fowls are likely to make good table fowls or first-rate layers. In France the judging is exactly reversed. The points which denote economic qualities are looked for first of all, and then an examination made for externals. They know that birds which have special characteristics are best, either as layers or on the table, and thus they look out for these points, and breed to them."

Mr. Consul Gurney's Report on the Agriculture of the Cherbourg District, France, presented to both Houses of Parliament, ran as follows :—"The agriculturists of Western Normandy, having given up cereals, now get a very fair return for their capital and labour out of dairy-farming, poultry-rearing, and market-gardening, and London furnishes them with a profitable market for their butter, turkeys, geese, and poultry. Their fowls are carefully tended, and, having the free run of the grazing fields and the cider apple orchards surrounding the farmstead, add largely to the profits of the farm. Fostered by shows which are based upon the fallacious principle of breeding for feather only, a grievous mistake from a practical point of view, poultry-keeping in England has become too much of a fancy, benefiting only prize-winners and opportunist poultry-breeders catering for the newest fad in shape and colour."

These quotations could be supplemented to an almost indefinite extent from the fanciers and fanciers' press of both England and America, but I will content myself and conclude with the following from a pamphlet entitled "Poultry and Eggs for Market and Export," by a former expert to the Department of Agriculture, New Zealand :—"It must not be presumed that a bird that takes first prize at a poultry show is the best bird for the farmer. It may be the worst. Most of the pure-bred birds in this country are of the fancy class, and have been bred for showing only. They are deteriorated in useful qualities by in-breeding, by breeding from birds known to be poor layers, or weakly, because they show good points in feathers. The result is a loss in constitution ; the birds themselves are subject to disease, and their chickens hard to rear. The egg-producing qualities have suffered even more. Many breeds once noted for laying have lost their good name through fancy breeding. Keeping back pullets from laying in order to increase their size is often practised by fanciers, and has a depressing effect on fecundity."

All the handicaps to profitable poultry-breeding as enumerated in the above extracts were well known, but the usual apathy of breeders allowed this state of things to continue, until the late William Cook conceived the idea of producing a breed with constituents calculated to stamp it as one of the very best for commercial purposes, and that while amenable to "improvement in appearance" by fanciers, would be by its colour and constitution, able to withstand all the effects for ill to which other varieties have been subject, and whether the big black fowl originated by him, and named after the town in which he then lived, was one of the best commercial, and despite exhibiting continues so, is one of the purports of this paper to show.

Of the many varied regrets indulged in by writers on the injury done to commercial poultry by hobbyists, the majority are to the effect that fancy and utility should, or could, be combined in such a degree that fowls, when put in the exhibition pen, could be awarded prizes on the same principle as that of other stock. A judge, when making awards in the Ayrshire cattle class, first looks for the points which indicate purity of breed, and as the commercial character of this breed is a big milk yield, the judge then looks for the development of certain organs which are associated with and indicate a liberal milk supply. The same in breeds noted for beef qualities; type is looked for as an indication of the purity of the particular breed, and then the great muscular development and big square frame on which to build this meat. Sheep are judged in the same way for wool or meat, certain indices pointing to a superiority in either, *i.e.*, commercial superiority. Not so with poultry, for, as has been frequently said, the champion hen, although perfect in all the points of her breed, may not be capable of laying an egg, while the first prize rooster may be useless in reproducing his species. This brings me to the "utility and fancy combined," and from much research in the vast tract of American poultry literature, there is not a doubt but the Yankees have to a great extent combined the two. Their judging standards are not of the arbitrary nature of those adopted in England, and which we faithfully follow here, with the result that although the American prize birds in many breeds could not win, judged by our standards, at the same time the purity of race is much more pronounced than with us, many of their breeds being pedigreed for over a quarter of a century, the Felch and other bloods being as faithfully perpetuated and as familiar in certain breeds of poultry as the "Bates" in English shorthorns, the above pedigreed strains being noted for their great laying qualities as well as their show-pen excellencies, while other breeds not only retain the economic qualities which accompanied them upon their introduction, but have improved in usefulness, while the same breeds under our system have been improved almost out of existence. Brahmas, which for their unproductiveness have now but few patrons here, are among the most prolific layers in America, following closely on the Wyandotte for popularity. Plymouth Rocks, which have scarcely a dozen breeders in this State, are only second to Wyandottes in that country in popularity, and form the bulk of the American export poultry trade to England.

There are a number of breeders in England who advocate that a system might be adopted of judging commercial qualities by appearance, as in other stock, the specimens whose appearance indicates the greatest laying capacity or the best flesh-formers to be awarded the prize; in other words, a combination of the beautiful from a fancier's point of view, and the economic from the commercial standard. Thanks, however, to the laying competitions incepted here, and now general throughout all the Australian States, it is being abundantly proved that under the present English Poultry Club standard as used in Australian shows, the utility and the fancy side of poultry can, and is, being combined, and that in more than

one breed or variety which made laying records included specimens of the best exhibition type and colour of their respective breeds; and there cannot be a doubt but that should these competitions continue, and patrons of the various breeds look after the appearance as well as the performance of their birds, ere long the combination of the fancy and utility side of poultry-keeping will be an accomplished fact; and so far as the breed which gives the title to this paper is concerned, for whatever or all purposes required, the performances and records already made conclusively prove that exhibition and useful qualities can safely be combined in one breed.

Chapter XVII.

Justification for New Breeds.

In the preceding chapters I have shown that the majority of the poultry productions of the past fifty years were heralded on their introduction as superior in some commercial essentials to their predecessors; that those who tried them, and the most competent authorities of the day subscribed them as superior, and just as sure in later years did the majority of these breeds, in an economic sense, come to grief, the show-pen system receiving credit for their retrogression. An article in a leading fanciers' paper on this subject I think worthy of reproduction:—

"Those who have much experience in poultry-keeping are aware that although the laying qualities of various breeds are capable of being described as good, bad, or indifferent, this description by no means universally applies to individuals or families of the breed. Even in breeds which are known as very good layers, some birds will be found which are far below par in this respect; while in breeds noted for their poor laying qualities, exceptional birds sometimes produce wonderful results.

"This divergence has its origin, we think, in the fact that birds are in this country bred from two perfectly distinct, and, to a certain extent antagonistic, objects. On the one hand, the poultry fancier is striving for perfection in colour and marking, for size, and for other fancy points. This aim he pursues quite without regard to the laying qualities of the birds selected to be bred from. It may be that the best fancy bird is a bad layer; but none the less the few eggs she lays are treasured and hatched out in preference to those of any other bird in the yard.

"This alone materially affects the laying qualities of many prize strains. In addition to this, however, in those breeds in which size is an object, exhibitors actually take means to prevent the early laying of the pullets. It is found that upon her commencing to lay, the growth of a pullet practically ceases for the time being. If this period can be delayed she continues to grow, and thus makes a better exhibition specimen. This is done by using non-stimulating foods, and moving the birds from yard to yard according as they show the

least symptom of attaining maturity and commencing to lay. A still further reason for deterioration is to be found in the fact that the best birds are sent much about from show to show.

"This, like moving from place to place, but to a much greater extent, retards laying. These processes being repeated from generation to generation, the laying qualities of almost all prize stock have been materially impaired; and it is only in exceptional instances that birds of prize strains are good layers.

"It is curious to note how, time after time, the latest novelty in the poultry world is hailed as the layer, and how, time after time, the laying qualities are gradually lost, and the supposed first-class layer loses its character in this respect even amongst its warmest votaries. As an illustration of what we mean, we may instance the Brahma and the Leghorn, both of which when introduced to this country had claims, and just claims, for pre-eminence as layers. Now the Brahma has almost universally lost its character as a layer, while the Leghorn is just hovering between the character of a good layer and a bad layer, according to the particular strain which is kept. On the other hand, there are throughout the country a few (though far too few) persons who regard laying qualities as of primary importance, and who, in the breeding of their stock, carefully keep that end in view. One breed or another may be selected for this purpose, and as purchasers from these strains find their birds are distinguished by good laying qualities, they rush to the conclusion that others of the breed are equally good in this respect. In this way the greatest diversity of results is obtained from different individuals of the same breed, and we see the curious spectacle of one poultry-keeper writing to say that he can only get eighty eggs a year from his Andalusians fed in such a way, while another hastens to reply that he keeps the same breed and gets 180 eggs per annum.

"Poultry shows have undoubtedly done good in establishing the pure breeds throughout the country; but poultry-fancying does harm, in that it casts abroad through the country strains of inferior laying qualities, and thus checks in many instances poultry-keeping on a small scale without any view to exhibition. The difficulties pointed out in this article materially affect the poultry prospects of the county."

The majority of people, realising the truth of the above, might very naturally be expected to condemn a system involving such disastrous results to the varous breeds. However, the fact remains that as deterioration has given the cue to some enthusiast who shortly appears with a new breed possessing the strongest of all claims to public recognition, the great handicap to all the hitherto productions being the fact that a universally good breed could not be kept an eternally good breed. This great drawback to the best breeds was to many of the poultry-keepers well-known, and more than one attempt was made to produce a fowl combining an excess of meat and egg properties, and adapt itself to the fanciers' art, without involving any decadence in usefulness. This ideal fowl, or at least, as near so as can within reason be expected, was at last produced, and from the

time it was sent out to the public in 1886 to the present day, has not only become the working-man's and the rich man's fowl, but has increased in popularity, and although taken in hand by the fancier, has not, like other breeds, deteriorated in useful qualities, but continues the same good all-round fowl as it left the hands of its originator, who named it after the village of which he was resident—Orpington (in Kent).

Originator of the Orpington.

Prior to 1883 poultry interests in England had no special journals, as now. Poultry show reports and poultry interests generally were looked after by the *Stockkeeper* and the then *Live Stock Journal*; but as dogs, pigeons, and other fancy stock found a place therein, little space was allotted to the fowls. A then, and yet, very popular weekly, *The Journal of Horticulture*, conducted by Dr. Hogg, LL.D., gave weekly insets devoted to poultry, amongst its contributors being the late A. Comyns, LL.B. The success of this section of the journal prompted the proprietor in making a new venture in the fanciers' world by starting a paper entitled *Poultry, Pigeons, &c.*, of which Mr. Comyns became editor. About, or rather, before this time, a good deal of correspondence had appeared relative to a man named Cook, who was making a great noise in the poultry world—not as an exhibitor or prize-winner, but relative to the keeping, breeding, and crossing of fowls for profit; and not content with that prominence, he actually published a book entitled "Cook's Breeder and Feeder; or, How to make Poultry Pay," many of the statements contained therein being of such a glowing nature relative to the possibilities of the business that he was ridiculed by the exhibiting poultry breeders.

Mr. Comyns, the editor of the new paper, on its introduction stated that the practical side of the poultry question, as apart from the fancy, would be a subject of much importance in its columns, and to that end he had carefully gone through Mr. Cook's book; and although the figures therein were startling, and the results of certain crosses also wonderful, the book was favourably reviewed; but to further test the accuracy of certain statements, Mr. Comyns visited the author at his then residence, Chislehurst, the following being his report:—

"Hostile criticism of Mr. Cook and his book, and incredulity as to his statements, had not been wanting, and we endeavoured, so far as lay in our power, to so frame our inquiries and make our investigations to test the accuracy or inaccuracy of the statements contained in the book, and the amount of credit to be attached to the author's statements.

"We must state, in the first instance, that Mr. Cook is a working man in the strictest sense of the term. He holds a situation in the employment of a gentleman, and resides himself, with his family, in a small house or cottage—one of a row of similar houses. He has been for years past a breeder of one sort or another of live stock, and has devoted special attention to the production of fowls remarkable for their laying qualities."

Mr. Comyns showed that in Mr. Cook's small yards there were a number of breeding pens, the male birds in each pen being mated to hens of a different breed, and consisting of Dorkings, Houdans, Game, Brahmas, Hamburgs, Minorcas, Cochins, and Plymouth Rocks. It will be noticed that one or two of the most popular varieties—Wyandottes and Orpingtons—are absent from Mr. Cook's list of crosses; but it must be remembered that Wyandottes, although then in England, were in such limited numbers, that in the year 1882 not a single show provided classes for that breed; and although a few specimens did appear in show pens, they were only to be found in that refuge for the destitute "any other variety" class, hence their absence in a small yard in Chislehurst need cause no surprise, while for Orpingtons, they were only issued to the public in 1886. Still, as Mr. Cook acknowledged several years labour in their manufacture, the progenitors of our Orpingtons were among the list of breeds or crosses then located in Mr. Cook's back garden, on the occasion of Mr. Comyn's visit as reported above; and whatever ambition or hope Mr. Cook then entertained in the way of making a new breed of black fowls, the name under which they became known could not then have entered his head, seeing that they were called after the village to which he removed in after years.

After the interview alluded to Mr. Cook became a regular contributor to the columns of *Poultry*, his articles being original and practical as well, and were highly appreciated by those breeders whose object was profit. Cook's blunt statements, new methods, and astonishing figures frequently provoked sharp criticism, but these affected the new poultry apostle for nought. He went on his way writing, lecturing, and otherwise propagating the then new doctrine of making a living from poultry. Cook's name was now becoming a household word amongst economic poultry-breeders, his small place and methods being always free to those who came to look for information. Nearing the close of 1883, two well-known fanciers visited his yards, and reported as follows:—"We were not at all prejudiced in Mr. Cook's favour, but rather the reverse. The appearance of the crossbred birds is not pleasant to a fancier's eye, lacking that uniformity of colour which is so desirable. What a pity it is we cannot combine the good, the useful, and the beautiful. We inspected the result of thirty crosses, but those that struck us most were Houdan-Minorcas, a square-shaped, short-legged, with rich black plumage. We were also shown a fine collection of eggs from the crosses, rivaling in size the Andalusian, and there were any number of them, for box after box was produced.

About July, 1883, Mr. Cook removed from Chislehurst to Tower House, Orpington, where he had more room for his poultry experiments, the increased accommodation and better breeding facilities affording him much more extensive experience, which was readily and freely given in contributions to the journal already referred to. One of his articles—Pure Breeds *v.* Mongrels—I think worth repeating here:—"What I want the people to understand is that birds may be pure-bred without having their fancy points developed to such an

extent as in the case of exhibition stock, and that these pure-bred birds may be bred with special regard to their useful points without allowing them to degenerate into nondescripts. I can assure my critics that it can be done, and that useful qualities so bred for can be established in pure breeds with far greater certainty than in any mongrels I have ever seen. Uniformity of appearance must also count for something. Those who bred for exhibition have done much good in the way of improving size, and those who go in for first crosses have done much in the way of meat and increased egg production. I do not say but that there are some decent birds to be found in the yards of mongrels; but I have never heard of anyone's yards being improved by these birds."

This, then, is a brief review and opinions of the man who a few years later put to the public a new breed of fowls of large size, combining the best qualities of the most desirable breeds, and one that inbreeding with its deteriorating tendencies need not be resorted to by fanciers to improve it for the show pen.

(*To be continued.*)

Blue-gum Spokes.

Some highly satisfactory tests of the strength and resisting power of Victorian blue-gum have just been made at the Engineering School of the Melbourne University. The samples were taken from the Apollo Bay forest. A piece, of 30 inches span and measuring 5 inches by 3 inches in thickness, that had been seasoned for seven years, withstood a strain up to 27,650 lb. Its weight was 63·6 lb. per cubic foot. A trial was then made with a piece of blue gum that had been part of a skid for five years and had been made into a spoke. It was tested as a column, the area of pressure being 2·04 square inches, and it bore up to 17,490 lb., or 8,573 lb. per square inch. Samples of oak and hickory tried at the same time showed resistance equal to 3,867 lb. per square inch and 4,065 lb. per square inch respectively. These tests of blue gum are remarkably satisfactory, and as there are in Victoria vast quantities of superior blue gum, it seems only a matter of time, when Australia will cease to be interested in the gradually-lessening supply of American hickory. Sufficient examples of the high qualities of Australian-grown timbers for wheels have already been seen to show that with a system of selection under which none but the very best grades of timber are used, spokes can be produced here at least equal to anything imported.—*The Australian Coachbuilder and Wheelwright.*

Mortality in Cattle caused by eating "Poison Tulip."

J. D. STEWART, M.R.C.V.S.,
Government Veterinary Surgeon.

During last month a serious mortality in cattle was investigated, which proved of more than ordinary importance to stock owners.

It appears that ninety-six head of cattle were mustered out of what is locally known as the "racecourse paddock," where they had been depastured for the previous six months, and driven through No. 2 paddock to the stock yards. There eighteen were drafted out for market, and passed into an adjoining paddock, No. 1, while the remainder were put back into No. 2 paddock, all being apparently in the best of health. On the following morning it was found that several of the drafted cattle had broken through the fence during the night and apparently rejoined the mob in No. 2 paddock. On searching for them the stockmen found three dead and several of the mob sick. It was, therefore, decided not to disturb the cattle. Within twenty-four hours ten more died and thirteen were noticed to be unwell. On my arrival next day an additional five had died, and sixteen were found to be affected, some of which subsequently succumbed. The total fatality was twenty-five.

On examining the affected bullocks at a distance, it was observed that many stood in a "propped-up" fashion, back arched and flanks tucked up. On being made to move, their hind quarters swayed from side to side in an uncontrollable manner, and often the hind toes were dragged along the ground, the animal being unable to bring the legs forward. In some cases the paralysis was so complete that when the animal rushed it fell, and was unable to rise again, although repeated struggles were made to do so. On closer examination, the muzzle was noticed to be very dry, the white of the eye changed to a dark red colour, pupils contracted, while the presence of severe abdominal pain was indicated by grinding of teeth, moaning, and repeatedly throwing the head back towards the flank. Occasionally the animal would lie on its side and stretch itself out with legs stiffened. The bullocks were too wild to take their pulse or temperature with any degree of accuracy. At the commencement of the mortality, death occurred within a few hours, but towards the end cases lingered two or three days, while a few that went down made a good recovery.

On death, decomposition set in rapidly. There was no discharge from nose, mouth, or anus, but the latter orifice was often found everted and inflamed. On making a *post-mortem* examination, the blood was found to be dark, and usually did not coagulate very firmly. There was a variable quantity of straw-coloured fluid in both the thoracic and abdo-

minal cavities. The lungs were engorged with dark blood, and the heart showed numerous dark-red extravasations, particularly beneath its lining membrane. The food in the third stomach was dry, and patches of

Poison Tulip *(Homeria miniata).*

extravasated blood were seen on the "leaves." The mucous membrane of the fourth stomach showed patchy congestion, and the bowels, particularly the small intestine, severe inflammation. The liver appeared unaltered, but the gall bladder was distended with dark-green fluid bile. There were some hæmorrhages under the kidneys, and the organs themselves were congested. The spleen was slightly enlarged and softened. The bladder contained a large quantity of highly-coloured urine, while its mucous membrane was slightly congested. The brain was also slightly congested. In the acute early cases, where the affected animal died within a few hours, Mr. Inspector-of-Stock Brooks informs me, the changes found were similar, but more pronounced. In one case he found the spleen much enlarged and softened, as is met with in anthrax, and blood was present in the lumen of the bowel. The bile he described as rather thicker and darker than that of the carcases I examined.

Bulb of Poison Tulip.

Microscopic examination of blood and of smears from spleen taken from a recently-dead animal failed to reveal the presence of micro-organisms, a result subsequently confirmed by cultural tests.

On examining the pasture in No. 2 paddock, patches of a plant known locally as the "Wild eschalot" were found. As this plant was recognised as belonging to a poisonous family, specimens were submitted to Mr. J. H. Maiden, Government Botanist, who identified it as *Homeria miniata*, or "Poison Tulip."

In order to prove beyond doubt that the tulip was the cause of the mortality, a small handful (3 oz. by weight) was chopped up finely, mixed with chaff and bran, and fed to one of the experimental heifers at Randwick Stock Quarantine. In six hours the animal showed signs of nausea, and in less than nine hours symptoms resembling those observed in the bullocks became manifest. For the following forty-eight hours the hind-quarters remained weak, the animal being very uncertain in movement. It is, therefore, evident that the tulip possesses powerful poisonous properties.

The fact that the heifer could not be induced to partake of a second quantity, although skilfully disguised in her food, explains the apparent immunity of stock that become accustomed to pastures containing the tulip.

In the *Agricultural Gazette* of February, 1904, Mr. Maiden, in referring to a specimen of bulbous plant said to have caused the death of some cattle, and forwarded for identification from Penrith district, and which proved to be the so-called Cape Tulip, mentions that it has been connected with the poisoning of stock in South Africa, Victoria, and South Australia. He also adds that: "Apart from the abundance of seed (and the capsules of the plant are full of it), it is propagated abundantly by the innumerable little bulbils (incipient plants) which the plant bears. I know of no means of coping with it, except by carefully digging it up before it seeds. It is a pretty plant, and is an escapee from gardens. Zealous war should be waged on it. It possesses a facility for getting the wrong side of the fence."

Flower of Poison Tulip *(Homeria miniata).*

Mr. Maiden's description most aptly applies to the circumstances in connection with this particular case, there being evidence that the plant had escaped from a garden of an old homestead on an elevated portion of No. 2 paddock, and had gradually spread to the fertile flats.

Owners of pastures containing the plant should, therefore, lose no time in taking steps to eradicate it. When in small patches it can be taken out with a hoe as it appears each season, but once it establishes itself in a fertile pasture the only practical method of suppressing it appears to be putting the affected land under crop for a number of years.

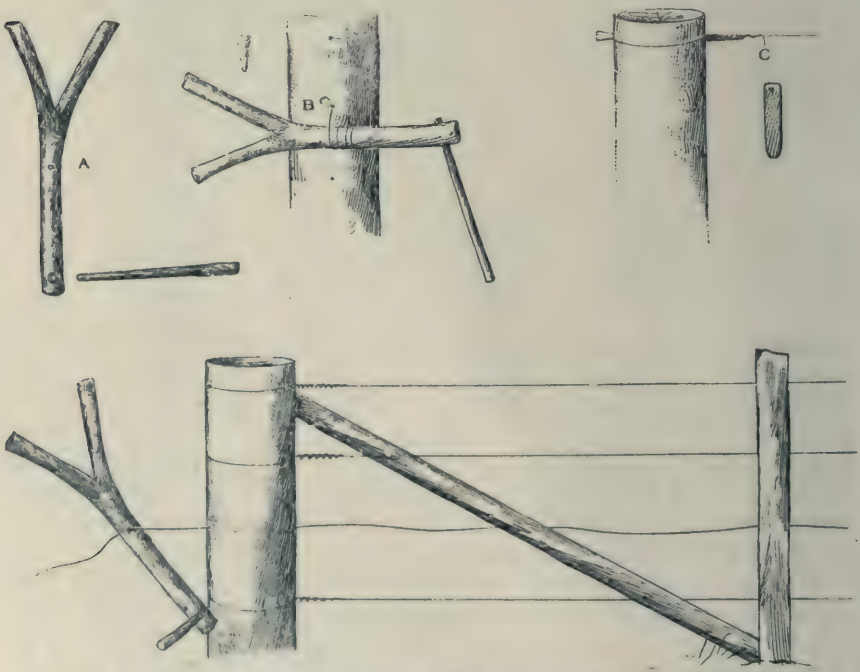
Some Hints on Fencing that may be useful to Settlers.

R. H. GENNYS.

In putting up a wire fence only—supposing the timber is already laid on the ground—the first thing to do is:—

Digging Post-holes.

The holes should be from 22 inches to 24 inches in depth, and there is no necessity to make them too big, which involves unnecessary labour both in digging, filling, and ramming; besides, the post will not have such a firm grip in the ground. They should be a little more than large enough to receive the posts comfortably, and leave room for the rammer to work to bottom of the hole. Dig the full depth straight away; if a



Forked Wire-strainer, Wire-key, and Plug.

little too deep it is easy to put in some loose earth to make post required height. Sight your posts from the centre, fill in and ram the bottom—say, the first 6 inches—thoroughly well. The bottom, and near it, is the place where ramming is most required; as the top is approached less ramming will do. Place earth that remains neatly around the post to allow for subsidence.

The tools required for post-hole sinking are a medium-size iron bar with rammer head and chisel point, and a long-handled shovel. This latter tool should have a round nose and be bent inwards at the sides, so as to form a kind of scoop. Small post-holes cannot be dug with wide shovels.

Sink post-holes, if possible, when the ground is in good condition—not too wet and not too dry. Ground saturated with moisture is not benefited by ramming, and will set better without.

Erecting Posts for Wire Fencing only.

Split Posts.—The dimensions of which should be somewhere about the following:—8 in. x 4 in., with a face of not less than 4 inches, and 6 ft. 6 in. in length. Posts may be from 7 ft. to 12 ft. apart from centre to centre, but, where battens or droppers are used, may be further apart still.

Put all large and sound ends into the ground; place the posts into position so as to be quite firm, after the manner hereinbefore described under "Digging Post-holes."

Spacing and Boring for Sheep-proof Wire Fencing.

The following gauge for a 7-wire boundary fence has been found to be thoroughly reliable, and after a two years' test no stock have got out of it, with the exception of one beast that jumped over.

The height from surface of the ground to the top of the post is 4 ft. 6 in.

No. 7 wire	3 inches	from top of the post	
6 ,,	12 ,,		No. 7 wire.
5 ,,	9 ,,		6 ,,
4 ,,	7 ,,		5 ,,
3 ,,	6 ,,		4 ,,
2 ,,	5½ ,,		3 ,,
1 ,,	5½ ,,		2 ,,

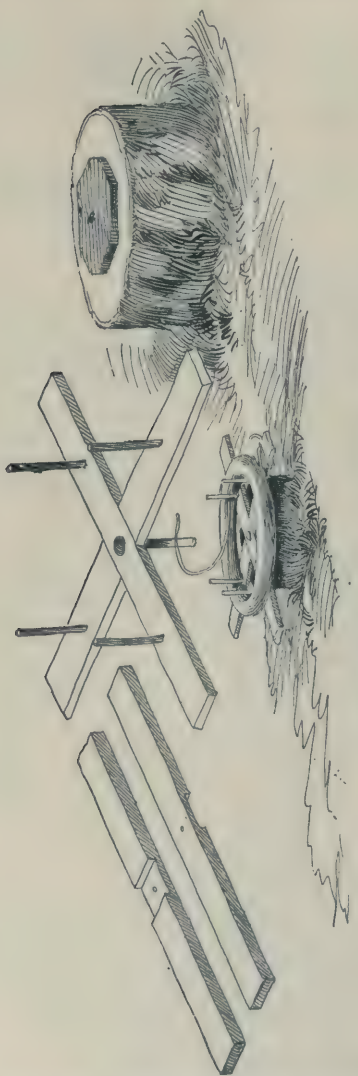
Surface of ground 6 inches from No. 1 wire.

When boring, use a $\frac{5}{8}$-inch auger, if No. 8 wire is to be used, and also battens; this will allow wire to run freely. If no battens used, $\frac{1}{2}$-inch auger will be large enough. Bore straight and right through, so as to push out anything that may impede easy threading of the wire.

Running or Threading Wire through Split Posts.

An easy and simple way to do this is to place the coil on a reel made on the capstan principle; this allows the wire to run off freely, and prevents it getting entangled, &c. The wire is then pulled through the holes from one strainer post to the next, and strained up tight. It can, however, be fastened anywhere between the posts with a patent strainer. This can also be made to work at a post, which is an improvement. Another way is to bore right through the strainer posts and pull up either with rollers or forks.

Strainer Posts are the mainstay of a wire fence, and should be of the best timber procurable, with a diameter of not less that 12 inches. Those



Reel for carrying and unwinding wire.

used at angles should be mortised to receive stays or struts. The strainers should be let into the ground at least 3 ft. 6 in., and be very thoroughly rammed. All posts should have the bark taken off before being put into the ground.

Stays or *struts* should be used at all corners, two for every angle, to be placed inside, clear of the split-posts, not less than 13 feet long, and 6 inches in diameter at small end, with a good strong stake driven into the ground about 15 inches deep at the end; the large end should be away from the strainer. One stay may be used, which divides the angle equally and projects into the paddock, but is awkward and somewhat dangerous at corners for large stock.

Where timber is plentiful, four stays may be used at a strainer post with advantage, two on each side of the wire, on opposite sides of the strainer, and mortised into it, close together, not more than a few inches apart, and secured as before mentioned. Do not have stays too short; they should be at least 13 feet long, and do not use a post in the fence instead of a stake for a support.

Strainer posts should not be more than 4 chains apart.

Drawn Iron Fencing Wire.

Wire gauge.	Weight of 1 mile. cwt.	qrs.	lbs.	Length of 1 cwt. yards.
4.	6	1	14	276
5.	5	1	7	332
6.	4	1	19	397
7.	3	2	20	479
8.	3	0	8	573
9.	2	2	10	680
10.	2	0	7	819
11.	1	2	18	1,050
12.	1	1	2	1,393

Posts to the Mile.

(Fractions neglected.)

ft.	in.		
8	3		640
9	0		5 7
10	0		528
11	0		480
12	0		440
13	0		409
14	0		377
15	0		352
16	6	(1 rod)	320

Hawkesbury Agricultural College and Experimental Farm.

Agricultural Education.

H. W. POTTS.

[A lecture delivered at the Royal Exchange, Sydney, 16th August, under the auspices of the University of Sydney.]

Germany.

The small kingdom of Wurtemberg, of the German Empire, with a population of 2,000,000 living on an area of 7,531 square miles—area of New South Wales, 310,700 square miles, forty times the size of Wurtemberg—is probably the most complete example of the effect of agricultural education we possess. A contented, happy, and prosperous people is the verdict of all who visit this fertile country. Sixty-four per cent. of the land is arable, and 75 per cent. of this is in the hands of the well fed, housed, and clothed peasant proprietors, whose farms are of the average size of 14 acres. Cereal crops, tobacco, fodders, sugar-beet, chicory, grapes, fruits, and vegetables are grown in wonderful profusion. The rearing of live stock and dairying are conducted.

Land is easily acquired by thrifty workmen, for which they are indebted to liberal land laws and the excellence of the country roads, also the establishment of village banks from which money is secured on easy terms.

It is only fifty years since Wurtemberg had the reputation of being one of the poorest of the German Provinces. Agriculture failed to provide a means of subsistence, mainly owing to a bad system of financial aid and the ignorance of the peasants.

To two leading men is due the credit of raising the country to its present happy condition of affluence, prosperity, and contentment. A pauper is now unknown in the country.

A scheme of village credit banks to advance money to small landholders, to be returned in small weekly instalments, was designed and brought into practical operation by Dr. Raiffeisen.

Dr. Steinbeis visited the Great Exhibition in London in 1851, and there the idea occurred to him of formulating a scheme of technica education for the rural population of his native country. His book "Elements of Work Schools" formed the basis of a compulsory and universal teaching of agriculture.

The first of the winter schools was compulsorily brought into operation in 1879, at which every pupil attended a course of general and

agricultural education of at least two evenings per week for six months. There are now 700 schools, with an attendance of 16,000 pupils. There are over 100 voluntary evening schools, attended by 2,000 pupils over 18 years old. The village schoolmaster is trained at suitable centres in this course of teaching, and is assisted by itinerant specialists or experts in the technical details of agriculture.

From these elementary schools pupils who desire to follow agricultural education further pass on to the Farm Schools or Colleges. There are five of these schools with model farms attached; a course extends over three years. The pupils are sons of small landowners, farmers, and agricultural labourers. They receive board and instruction free of charge, giving their labour on the land for this privilege.

From these farm schools the student has the opportunity of entering what is generally recognised as the best agricultural college in Germany, and probably the most perfect institution of its kind in the world, the Agricultural University of Hohenheim, which has been established since 1818. It was promoted to the rank of a university in 1847. To it is attached a College of Forestry, a model farm, technological institute, sugar factory, distillery, brewery, vinegar factory, laboratory for testing garden and farm seeds, and a department for proving agricultural machinery, a butter and cheese factory and model dairy, poultry yards, live stock departments, fish-breeding ponds, and a bacteriological institute. A splendid museum is attached, in which is found a unique collection of agricultural products and implements, soils, and minerals.

The library contains 14,000 volumes, and an herbarium of some 30,000 plants. The physical, chemical, botanical, and biological laboratories are models for teaching purposes and equipment.

All agricultural implements and machines are submitted to rigid examination and tests in the presence of the farmers. New methods of culture, manuring, new varieties of plants and seeds, are tested by a competent and separate staff.

This splendid system of complete agricultural education, combined with the establishment of the co-operative banks first started by Raiffeison in Stuttgart in 1880, have doubtless provided the requisite stimulus and knowledge to effect such excellent results. There are over 700 of these co-operative banks in Wurtemberg—the usurer has disappeared.

The vote for agricultural education for the province exceeds £80,000 per annum.

A compulsory course of training in agriculture, gardening, and horticulture of two hours weekly is found in all the primary schools of the German Rhine Province during the final two years of the school curriculum. The teacher is given a free hand in determining the character and scope of the training in which the agricultural needs of the district are to be considered. The success of the tuition, it is fully recognised, largely depends on the theoretical and practical knowledge possessed by the teacher, his enthusiasm, and ability to teach.

France.

In France the Organic Law of 1850 placed "Elementary instruction in agriculture" as an optional subject for teaching in the curriculum. An agitation commenced in 1860 to make the teaching of agriculture in the primary schools obligatory; this terminated in 1879 by provision being made for departmental and communal instruction in agriculture by means of departmental centres, and further made primary instruction in the elements of agriculture an obligatory subject.

In the instructions issued to teachers under this law they are advised that—"they should commence by employing visible and tangible objects, which they should make the children see and feel, thus putting them face to face with concrete realities; then by degrees they can exercise them in obtaining from these objects abstract ideas, by comparison and generalisation, and by the use of the reasoning faculties without the aid of actual specimens."

The law of March, 1882, made compulsory teaching "the elements of physical and natural science with their application to agriculture."

In 1888 a further revision of the methods of teaching agriculture in the primary schools was declared essential. Finally the French Minister of Instruction issued the following guide to public school teachers on the 25th April, 1898, to direct them in this routine work of teaching elementary agriculture:—

"Instruction in the elementary principles of agriculture, such as can be properly included in the programme of primary schools, ought to be addressed less to the memory than to the intelligence of the children. It should be based on observation of the everyday facts of rural life, and on a system of simple experiments appropriate to the resources of the school, and calculated to bring out clearly the fundamental scientific principles underlying the most important agricultural operations. Above all, the pupils of a rural school should be taught the reasons for these operations, and the explanation of the phenomena which accompany them, but *not* the details of methods of execution, still less a résumé of maxims, definitions, or agricultural precepts. To know the essential conditions of the growth of cultivated plants, to understand the reasons for the work of ordinary cultivation, and for the rules of health for man and domestic animals—such are matters which should first be taught to everyone who is to live by tilling the soil; and this can be done only by the experimental method.

"The master whose teaching of agriculture consists only in making the pupils study and repeat an agricultural manual is on the wrong path, however well designed the manual may be. It is necessary to rely on very simple experiments, and especially on observation.

"As a matter of fact, it is only by putting before the children's eyes the phenomena to be observed that they can be taught to observe, and that the principles which underlie the science of modern agriculture can

be instilled into their minds. It should be remembered that this can be done for the rural agriculturists only at school, where it will never be necessary to teach him the details which his father knows better than the teacher, and which he will be certain to learn from his own practical experience.

"The work of the elementary school should be confined to preparing the child for an intelligent apprenticeship to the trade by which he is to live, to giving him a taste for his future occupation; with this in view, the teacher should never forget that the best way to make a workman like his work is to make him understand it.

"To sum up: The aim of elementary instruction in agriculture is to initiate the bulk of our country children into that degree of elementary knowledge which is necessary to enable them to read a modern book on agriculture with profit, or to derive advantage from attending an agricultural conference; to inspire them with a love of country life, so that they may prefer it to that of towns and factories; and to convince them of the fact, that agriculture, besides being the most independent of all means of livelihood, is also more remunerative than many other occupations, to those who practise it with industry, intelligence, and enlightenment."

This entailed the provision for establishing school gardens and farms. At the present time nearly 4,000 primary schools in France have these farms. The training of teachers for rural districts includes agriculture.

The superior primary schools' curriculum embraces lessons on general facts of agricultural production, treatment of the soil, principles of irrigation and drainage, the management of agricultural labour and machines, the study of insects, as well as special instruction in horticulture, arboriculture, and viticulture, the treatment and health of domestic animals, their breeding and fattening, dairy work, farm book-keeping, rural economy, bee-keeping, silk-worm culture, and poultry raising. Only those plants, animals, and methods are treated in detail which form a distinctive feature of the agricultural industry of the district. Weekly visits are made to farms, dairies, piggeries, and such like in the district, by the pupils accompanied by the teacher. Medals and money are awarded annually by the Government, municipalities, and agricultural societies, to both masters and pupils who distinguish themselves at competitive examinations on the subjects relating to agriculture and its allied industries.

Italy.

The Director-General of Primary and Normal Instruction issued, under date 29th November, 1897, a report, in which is shown that in 471 elementary schools practical teaching in the rudiments of agriculture was given, but shortly afterwards a strong demand was made to attach a piece of land to each school so that the essential rules of the art of

cultivating the soil could be learned by observation and experiment. The appeal was couched in the following terms:—

"Let us return to the fields! This is the invitation which from all time men of superior understanding and of generous hearts have repeated to the Italians. Be it granted to us to join them; let us enamour the rising generation with the land! From the little garden, where the country teacher shall practically teach the rudiments of agriculture, upwards through the technical schools and the professional institutes, may the knowledge of agriculture continually be reinforced and elevated; everywhere may there re-awaken the Virgilian affection for rustic labour."

In less than six months, 2,257 blocks of land, varying in extent from a small garden to that of a farm, were presented for the purpose. Courses of instruction were arranged for teachers at the Royal School of Practical Agriculture of Ascoli Picera, and certificates were issued to those who attended. Other similar institutions were utilised, where teachers acquired a sufficient knowledge and training of the principles and practice of elementary agriculture. Lectures were given at 184 places, with a total attendance of 8,000 teachers. In 1899 12,000 teachers had obtained the certificate of attendance.

Great care has been exercised to see that teachers know how to adapt their treatment of the subject to the age, intelligence of the pupils, and to local needs of the district; and also that the teacher possesses the aptitude, experience, and education necessary for his work.

The Department declined to adopt a general text book for pupils, on the grounds that it depended solely on the efforts of the teacher, for whom it was more essential to be provided with a text-book.

During the year 1898-9, 8,000 rural schools were given instruction on the subject.

Austria-Hungary.

To each elementary rural school a fruit garden is given. Special attention is devoted to the theoretical and practical teaching of agriculture. In the National Schools, instruction in agriculture is combined with natural history. The tuition embraces the description of domestic animals, vegetables, and minerals; the cultivation of vegetables and fruits, the breeding and rearing of cattle, agricultural methods, and, where local conditions are suitable, silk-worm rearing.

Hungary.

Hungary boasted of an agricultural college in the eighteenth century and may claim priority amongst the countries of the world in providing systematic agricultural education for her people.

Lectures on agriculture were first given at the University at Nagy Syombat in 1680. The first farm school was established at Syarvas. A Chair of Agriculture was established at the University of Sciences at Buda in 1777. Agricultural schools and colleges were established and endowed by several noblemen. There are now four agricultural colleges

with courses ranging from two to five years. Winter farm schools are maintained by the Government, at which 300,000 students attend.

Agricultural education now comprises :—

Higher teaching in the Agricultural Academy, with a yearly attendance of 157 pupils.

Intermediate education, provided by four agricultural colleges, at which there is a yearly attendance of 502 students.

Practical teaching and training in farm schools.

Itinerant teaching, conducted by seven departmental professors, who travel from place to place teaching, and four experts for the cultivation of hops, hemp, dairying, and promotion of rural associations.

Twelve professors are engaged in training teachers for the rural schools.

The staff of the Department of Agriculture numbers 185 professors, teachers, experts, &c.

Switzerland.

In Switzerland there are sixteen agricultural schools with about 400 students, who pay in fees £16 per annum each. The expenditure devoted to agricultural education has risen from £49,000 in 1888, to nearly £200,000. This is given towards the support of agricultural schools, aid to farmers, improvement of stock, prizes, &c.

Denmark.

The extraordinary agricultural development of Denmark is attributed to the intelligence and capacity for organisation of the Danish farmers, and mainly to the education received by the peasantry in their rural high schools, and to the distribution of land amongst freeholders. There are 224,000 farms in Denmark, ranging from 7 to 110 acres each, of which more than 94 per cent. are farmed by their owners.

Sir John Gorst, in referring to the progress of technical education in Great Britain, recently made the following remarks as to Denmark :—

"The important influence technical education had on the national, social, and economical development of the people was indicated in the case of Denmark, which had, from being the poorest of European countries become one of the richest, and that by producing butter, bacon, and eggs chiefly for the English market."

Sweden.

The practical teaching of agriculture with arboriculture has been in vogue for a very long period. Since 1865 the teachers of the National schools have been trained in these subjects. The regulations of 1882 states :—

"To every National School shall be annexed, so far as possible, a tract of ground to serve as an experimental kitchen garden, and it is the duty of the school council of every parish to see that such kitchen garden is arranged in a manner suitable to the object of instructing the children in agricultural subjects."

Belgium.

In Belgium the introduction of teaching agriculture in the rural primary schools dates from 1884. Article 49 of the regulations states :—

" The master must keep the garden belonging to the school in such a way that it may serve for practical instruction in the rudiments of agriculture, horticulture, and arboriculture. He must endeavour to make it into a model kitchen garden, containing the best varieties of vegetable and fruit trees."

Practical lessons both in class and in the gardens—on flowers, herbs, fruit trees, useful farm birds, and the common agricultural implements—are given at regular periods.

The expenditure of the Department of Agriculture exceeds £100,000 per annum.

England.

England has not been prominent in forwarding agricultural education with anything like the organisation and energy displayed by other countries in the past ; of late, however, a marked change has swept throughout the rural counties. In 1887 the English Government set aside £5,000 to be distributed among agricultural and dairying schools.

The Board of Agriculture distributes grants to Universities, Collegiate, and other institutions engaged in teaching agriculture and allied subjects. It inspects educational and experimental work. It conducts experiments. It publishes a monthly Journal, and leaflets to farmers.

The County Councils are awakening to the importance of this work, and now some twenty-six institutions are engaged in teaching agriculture, and something like £100,000 is expended annually in England on agricultural education and research work. No effort has been made yet to organise systems such as exist in Wurtemberg, France, Denmark, Belgium, Austria, Italy, United States, and Canada.

A Chair of Agriculture was founded in 1790 at the University of Edinburgh, but Scotland has always been to the fore both in education and agriculture. The Chair of Rural Economy, established at Oxford by Sibthorp in the eigtheenth century, has not been noted for its agricultural activity. The Royal Agricultural College at Cirencester was established by private enterprise in 1845, and others followed.

The most noted of all efforts to establish agriculture on a scientific basis was the world-renowned experiment station at Rothamsted, established by Sir John Lawes.

In 1899 a Chair of Agriculture was established at Cambridge, and a well-organised Department of Agriculture. The subject is also taught at the Universities of North Wales and Durham.

Ireland.

The Commissioners of National Education in Ireland make a special feature of their efforts to teach agriculture in all rural National schools. Numbers of these schools have school farms, gardens, and live stock.

Rural teachers go into training in practical agriculture in residence at the Albert Institution, Glasnevin, near Dublin, for six weeks, where they qualify for certificates to earn special fees for practical agricultural instruction to pupils. Teachers are not only given this training free, but are allowed travelling expenses to and from the Institute from any part of Ireland. No teacher is permitted to give tuition in agriculture unless he has been trained and possesses a certificate of competency.

Two agricultural colleges are maintained, one at Glasnevin, Dublin, and one at Cork, where a sound system of agricultural training is provided. Itinerant dairy instruction is organised throughout the dairying centres.

Canada.

Despite the rigorous climate, this Colony may be considered one of the most advanced in so far as agriculture is concerned. No finer example can be instanced to-day of the beneficial results of well-considered State action in the enlargement of a national industry. Twenty years ago agriculture in the Dominion was very much depressed. To-day the output of wheat, dairy, and other natural products is marvellous. It is admitted by all the farmers that this is mainly due to timely and wise Governmental action.

In 1885 Dr. Wm. Saunders was commissioned to visit the agricultural colleges of the United States and Europe, and obtain preliminary information for the Government. An Act of Parliament, based on Dr. Saunders' report, was passed for the establishment of experimental farms and the proper control of agricultural education and efficient organisation.

The Act has been liberally interpreted, and administered with judicious enterprise. Example and precept are utilised to create responsive vigour in the farmers, the chief aim being to induce them to abandon the old practice of wasteful farming by robbing the land of its fertility without returning an adequate equivalent. This is scientifically demonstrated. The results obtained from deep ploughing, clean land, rotation of crops, good seed, and an economic system of manuring, are all clearly brought home to the farmer's mind. Each experimental farm devotes itself to work out the problems of agriculture for that particular district. From this centre a proper distribution of acclimatised seeds and plants is made to the surrounding farmers. More than 100,000 farmers have received free during the past ten years 3 lb. sample bags of seeds. Twelve thousand packages of seedling trees, shrubs, and plants, and more than 6 tons of seeds of hardy trees, have been sent out free.

Agriculture is taught in the State rural schools, and proper training provided for the teachers. A text-book is published. An examination must be passed by the scholar in agriculture before admission is permitted to the High Schools.

The Agricultural College at Guelph, Ontario, presided over by Dr. Mills and a highly-trained staff of educational experts, provides training

leading from short courses of six months, up to the term needed to qualify for the Bachelor of Science in Agriculture Degree of four years.

In addition special effort is made to organise Farmers' Institutes, for both men and women, Live Stock Associations, and Dairying Associations, all of which are highly educational. At their annual conferences, papers are read, and instructive discussions follow. These are published in pamphlet form and distributed.

Dr. Saunders states: "*The occupation of farming has been elevated in the eyes of the community.* It is no longer looked upon as a sort of drudgery suited to the dull and slow-going, but is now regarded as a suitable field for the higher intelligence of cultivated minds. It is recognised as a calling requiring much skill to conduct it successfully, and as giving ample scope for the exercise of the most active and earnest minds, and one in which information of almost every sort may be turned to practical account."

United States.

In 1894 the Secretary of the Board of Agriculture (Major Craigie) after investigating the working of the Morrill and Hatch Acts in the States by direction of the British Government, states:—

"The American Government seems willing to face any cost to the community that promises the better to equip the farmer with the knowledge of his business. The authorities seem assured that in indicating methods of profitable production, and still more by the careful perfecting of the produce of the vast lands of the Republic in whatever direction of extensive or intensive culture the economic circumstances of the moment may prescribe, they are providing a solid means of advancing the well-being of the nation as a whole."

The Morrill Act of 1862 laid the foundations of superstructures, and created an organisation for the furtherance of agriculture, the value and extent of which are unequalled in any other country. In that year Congress alienated 10,000,000 acres of land to provide funds to establish, endow, and maintain agricultural colleges and experimental farms in every State of the Union. This created an activity and interest in agricultural education and research which developed with extraordinary celerity. In 1885 a convention was held by those associated with agriculture, when the following resolution was passed:—

> "That the condition and progress of American agriculture require national aid for investigation and experimentation in the several States and Territories."

The Hatch Act of 1887 was formulated and became law—

> "In order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

In order to render this effective and defray expenses, a sum of £6,000 per annum was voted to each State. In addition large sums are annually voted by the State Legislatures, and these are augmented by private benefactions. With these funds so amply provided, thousands of experiments have been and are being conducted in every branch of farm work, as well as in rearing live stock, particularly in regard to co-operative tests. The results of these are distributed to the farming community in the most complete way, and entail a lavish expenditure for printing.

Dr. True, Director of Experiment Stations, states all this has been accomplished with splendid results, and he reports "a remarkable awakening of our farmers to the desirability of having more definite information regarding all matters connected with their business. The result has been that the stations and this Department have been led to publish a vast amount of information, both old and new, which has been freely distributed to farmers in every State of the Union. Nothing like it has ever been seen before. No country has ever attempted so systematic and so thorough a distribution of information to its agricultural population, and no masses of farmers have ever so eagerly sought for information as have our own within the past few years. Such an intellectual awakening must have most important results, and there is every indication that it will go on increasing in volume and force until it has thoroughly permeated the entire agricultural population."

He points out the special features responsible for their success as follows:—

1. The wisest leadership, by well-trained men.
2. Scientific investigations in agriculture systematically conducted.
3. The thorough organisation of the agencies for distributing information among the farmers.
4. Energetic teaching in the agricultural colleges.

He does not hesitate to caution his countrymen against permitting political influence to interfere with the management of the colleges and stations. Experience in this direction has been of a most objectionable character in the past.

Mr. Wilson, the U.S. Secretary for Agriculture, thus sums up the work of his Department:—

"The Department, through its bureaux, divisions, and offices, is getting into more immediate contact with all classes of producers throughout the country. . . . Especial attention is being given to the reclamation of soils that have been reduced in fertility by injudicious management. Production from the soil in all parts of the United States is being diversified by importations from foreign countries. The scientist and the cultivator are working together for greater national prosperity through more economic production. . . . The especial attention of the Department in the future will be given to the production, under United States jurisdiction, of products of the soil that now come from foreign

countries, keeping steadily in view the object for which the Department was organised—the help of the producer who is struggling with Nature."

The fundamental basis of national education in the primary education of America is Nature Study. A leading writer states—"It designates the movement originating in the common schools to open the pupil's mind by direct observation to a knowledge and love of the common things in the child's environment." In the successful adoption of this method the personality of the teacher is pre-eminent; there must be enthusiasm. The aim is the development of mental, reasoning, and observant powers of the child. It enlivens the means of teaching to both tutor and pupil. The study of plants and animals can be associated with the earliest lessons in the common school. The readiness with which children improved under this method has resulted in its universal adoption in the States.

Recently an organised movement has been made to introduce the elements of agriculture into the rural schools, preceded by the establishment of school gardens. These were the outcome of the nature study education, and developed a trend towards agricultural training. The American League of Industrial Education, the National Educational Association, and the American Civic Association have all included in their propaganda the promotion of school gardens and farms, and the teaching of agriculture in the common schools.

The Dean of the College of Agriculture in Illinois gives the following reasons for teaching agriculture in these schools :—

1. To cultivate an interest in and instil a love and respect for land and the occupation of agriculture.
2. To create a regard for industry in general and an appreciation of the material side of the affairs of a highly civilised people.
3. To cultivate the active and creative instincts as distinct from the reflective and receptive that are otherwise almost exclusively exercised in our schools.
4. To give practice in failure and success, thus putting to the test early in life the ability to do a definite thing.
5. To train the student in ways and methods of acquiring information for himself and incidentally to acquaint him with the manner in which information is originally acquired and the world's stock of knowledge has been accumulated.
6. To connect the school with real life and make the value and need of schooling the more apparent.
7. As an avenue of communication between the pupil and the teacher, it being a field in which the pupil will likely have a larger bulk of information than the teacher, but in which the training of the teacher can help to more exact knowledge.

Several States have made provision for training the teachers in agriculture, and make it a compulsory subject in their examinations. At Cornell University a two-years' normal course is provided in nature study and gardening. Ten normal training-schools have been opened in Michigan for the express purpose of training teachers for rural schools.

Text-books have been published suitable for the various States.

In North Carolina State 12,000 children received instruction in agriculture last year.

In addition to the education in the rural schools, the provision made in the splendidly staffed and equipped agricultural colleges in every State, in proportion to its population, is not rivalled in any part of the world. The courses are arranged to meet the requirements of all classes of agriculturists, and extending from periods of twelve weeks to five years. The longer period course in most instances entitles the student to present himself for the Bachelor of Agricultural Science Degree, which is granted at all the American Universities.

The training in the high schools is essentially such as to mentally and physically equip a lad for the specific education in an agricultural college. The subjects of manual training, physiography, elementary chemistry, physics, geology, algebra, mathematics, and geometry are taught.

Popular Education of the Farmer.

For those farmers and their sons who are unable to attend the agricultural colleges of the various States, several schemes have been evolved. Short courses have been offered, and farmers' clubs organised on the University Extension plan. Under the auspices of the agricultural colleges and kindred establishments, such as the experiment stations and agricultural associations, farmers' institutes are now very popular, at which lectures and demonstrations are provided by the State experts, and often by those sent by the central authority at Washington. Michigan set the example in 1892. The railway companies realise how important it is to their revenue to have a well-educated class of farmer on the land through which their lines run, and offer the greatest facilities to farmers to attend courses of instruction. In fact, they supply special trains free to bodies of farmers of sufficient number to convey them to the agricultural colleges on special occasions to inspect the crops and methods pursued at these and the experiment stations where lectures are given by the officers.

One of the most recent methods adopted to reach the farmer is for the State to fit out two railway cars, one as a store for roots and seeds and as an agricultural museum or exhibit, the other suitably seated to act as a lecture room and sleeping apartment. Expert itinerant lecturers are engaged, and are conveyed through the rural districts free. A systematic course of lectures is thus given at every station where these cars are left, to the farmers in the district, either during the day or in the evening, whichever is found most suitable to the local residents.

Instruction is given, the exhibits are fully explained, seeds and roots are distributed free, and the railway companies are recompensed for their enterprise by the increased production and carriage on their lines, as a result of this advanced technical education.

This brief and necessarily incomplete *précis* of educational effort as it is conducted in the advanced countries of the world evidences the great attention now being devoted to it, and the stimulus thus provided for increasing the value of the primary industries.

One of the great factors towards this end is the experiment station or farm. A recent publication issued by the States Department of Agriculture by Messrs. True and Crooby, gives a brief account of 720 experiment stations and similar institutions throughout the world, embracing all civilised countries, the largest number of separate agencies being in Russia. There are 102 experimental stations and 3 experimental forests, the bulk of which are for the purpose of introducing new agricultural industries and teaching the peasants.

Germany possesses	80	Australia possesses	34
France ,,	71	Netherlands ,,	7
Austria ,,	41	Sweden ,,	26
Great Britain ,,	30	Norway ,,	12
India ,,	11	Japan ,,	15
Belgium ,,	15	Switzerland ,,	10
Hungary ,,	20	Canada ,,	12
Italy ,,	22	United States ,,	58

It will be seen that an attempt has been made in this lecture to demonstrate the necessity for preparing the child for rural occupations.

The primary system of education hitherto conducted has been more adapted to the requirements of urban than of rural children. Many who attend rural schools are unable to attend continuation or high schools.

It would further enhance the training of a child for country life by receiving its earliest training in Kindergarten. Children of both sexes are rendered more fitted for any occupation where manual effort and a trained eye are essential to success. To direct the child's mental and physical development to useful purpose, and in keeping with its surroundings, is the commendable aim of the new education. The education for a child intended for rural life should commence in the primary school from the first impulse to use the fingers in Kindergarten, to the unfolding of natural processes by nature study; the school garden, the study of flowers, fruits, vegetables, birds, insect life, the domestic animals, and manual training.

Sir Phillip Magnus, one of the highest authorities upon educational work, writes:—

"People often talk and write as if school time should be utilised for teaching those things which a child is not likely to care to learn in after life, whereas the real aim of school education should be to create a desire

to continue in after life the pursuit of the knowledge and skill acquired in school. In other words, the school should be made, as far as possible, a preparation for the whole work of life, and should, naturally, lead up to it. The endeavour of all educators should be to establish such a relation between school instruction and the occupations of life as to prevent a break of continuity in passing from one to the other. The methods by which we gain information and experience in the busy world should be identical with those adopted in schools. It is because the opposite theory has so long prevailed that our school training has proved so inadequate a preparation for the real work of life. The demand for technical instruction, both in our elementary and in our secondary schools, is a protest against the contrast which has so long existed between the subjects and methods of school teaching and the practical work of everyday life."

Any system of education tending to direct children's attention from rural industries in country districts is to be regretted.

In the new Syllabus issued by our Education Department, correlation, self activity, and reality are prominent, and the schemes for nature study and the rudiments of agricultural and elementary science are set out in such form as will tend to provide one of the missing links to the higher agricultural education.

This training will illustrate the phenomena of nature, train and expand the child's power of observation, excite an impulse to work, reveals attractive features in what has hitherto been considered menial work, and unfolds elevating influences in the child's surroundings.

This, however, opens up the question of training for our teachers. This may be regarded as the bed-rock of success in this connection. All the enthusiasm and earnestness of a teacher may be thrown away in the absence of a competent knowledge of the subject.

We have in our Agricultural College all the equipment for conducting the work, with the exception of the teaching staff.

Already a start has been made at the Hawkesbury Agricultural College, where 5 acres have been set apart for conversion into an orchard, flower, and vegetable garden, and experimental plots.

Another missing link is the education in the secondary schools tending towards the preparation of the student to rural life, and an entrance to the Agricultural College; in fact, complete the co-ordination of the different branches of primary, secondary, and technical education.

Many leaders of education in new countries such as ours will agree with Professor Ray Lankester, when he declared in the course of his Romanes lecture, delivered in the Sheldonian Theatre, Oxford, in June last, "That he wished to see the classical and historical schemes of education entirely abandoned, and its place taken by a scheme of education in the knowledge of nature." He urged the study of physics, chemistry, geology, and biology.

Our secondary schools might, with advantage, teach elementary agriculture, zoology, physiography, or physical geography, elementary physics, chemistry, botany, geology, mathematics, manual training, book-keeping, and physical exercise.

The Agricultural College is becoming more popular every year; greater provision will require to be made to meet the demand for further accommodation. The effectiveness of the tuition will be vastly increased by students who have gone through the training outlined in the primary and secondary schools. The usefulness of the College and Experiment Farms might be extended in such a way as to assist the elementary schools in training the teachers, and in supplying seeds, roots, trees, plants, &c., for the school gardens.

The University should prove the ultimate aim of those students whose attainments warrant them going to the higher training of a degree in Agricultural Science. New Zealand and Victoria grant such degrees, why not the Sydney University? One of the most urgent demands of our agricultural system is competent and trained men as teachers. This will become more emphasised, and to complete the chain of our work, the degree is essential.

I would, in conclusion, also urge a system of teaching to reach the farmer. Natural difficulties present themselves in our large areas, where the agriculturist is difficult to reach, but such are not unsurmountable. Farmers' institutes, reading courses for farmers, educational conferences, have been made a success in Canada and the United States by means of peripatetic lecturers. Our agricultural societies can be utilised as a basis to extend their work from that of organising an annual show, to technical education. One form especially commends itself to those whose life work in the country is associated with live stock, *i.e.*, "First aids to sick and injured farm animals." Immense losses are annually made through ignorance in the treatment of live stock.

I cannot close the subject without paying a tribute of praise to the New South Wales Parliament and the Department of Agriculture for the splendid organisation in the founding and conduct of essential aids to our producers. The *Agricultural Gazette*, the College, Experimental Farms, the Staff of trained Experts, the Scientific Staff, have built up, and are engaged in designing a system of agriculture suitable to our conditions, and of incalculable value to the country.

The lecture was illustrated by a large series of coloured illustrations, exhibited as lime-light views, of representative colleges, experimental farms, farm schools, gardens, &c., throughout the world.

Ducks and Duck Farming.

[Continued from page 916.]

D. S. THOMPSON,
Poultry Expert, Hawkesbury Agricultural College.

IV.

OTHER BREEDS.

The Aylesbury, Pekin, Rouen, Indian Runner, and Buff Orpington—these five breeds—may be looked upon for the present as our standard varieties of ducks, and this small list includes the whole of the duck family as bred to-day in domestication.

This chapter on "Other Breeds" will include a short list of ducks more or less bred in Australia or in other countries, but, at the present time, they are in the hands of a very few people, and there is no sign of them becoming popular at any early date.

These articles would be incomplete without some reference to the other at present little-known breeds, and, as many of them are of excellent merit, we are not going to be rash and predict that they will never be more popular than they are to-day. In fact, we are rather inclined to think that several of the breeds we intend to give a short description of, will, at an early date, become popular and far more largely bred than they are to-day. The nomenclature of the duck family in our exhibitions is a very limited one, and can easily be extended to at least double its size, and there is room for the development of a few new varieties. The old-timers, the Pekins, the Aylesbury, and the Rouen, will still go on; but the new varieties, the Indian Runner and the Buff Orpington, will far surpass them in popularity for a number of years to come, and it is possible that they will be followed by some new variety, or, perhaps, by the perfecting of some of the breeds already in existence, but which have, at least up till now, made little or no headway in the good graces of the general duck-breeder.

The Blue Orpington.

The Blue Orpington is one of the newly-created breeds, but it has made little progress, nor is it showing any signs of making much progress in the near future. The Blue Orpington and the Buff Orpington were imported at the same time, and while the writer we quoted, as reviewing the importations of the late W. Cook in 1900, said, "The Blue Orpington is a good-sized, square-bodied bird, of a blue-slate colour, and may well win a place in popular favour; but the Buffs are interesting, mainly, if not solely, because they are novelties"—yet we have found it just the reverse; the Blue Orpington has not yet found any popular favour, while the Buffs are now on the jump to become a very popular duck, and, in a few years' time, will be bred in thousands all over the continent. We have seen many specimens of blue ducks, but never perpetuated or bred for colour.

Lewis Wright also speaks of blue ducks, and of their being well known and largely bred in Lancashire, but he speaks of them somewhat disparagingly, and as of being very difficult to breed true to colour. However, that is a very common difficulty in many kinds of fowls, and a difficulty which can be overcome.

Blue Orpington Duck.

Mr. E. Butcher, of North Sydney, who was acting as agent for W. Cook and Sons, of Orpington House, England, was the first to import Blue Orpington ducks, in 1899. The second importer was Mr. S. Ellis, of Botany. Mr. Ellis has still the progeny of the Blue Orpingtons, but we believe Mr. Butcher has gone out of them through finding them very hard to breed to colour.

Of the most prominent breeders of the Blue Orpington duck at present in Australia, we find, besides Mr. S. Ellis, of Botany, that Mr. G. W. N. Brunker, of East Maitland, is a large breeder of the variety, and he has found them a very useful duck, but he also complains of the difficulty of breeding them true to colour.

No doubt, before long, this duck will also take a jump in popularity, and follow in the wake of the Buff Orpington. Of the two colours, buff is the more natural, and is, consequently, the easier bred. Both colours are undoubtedly produced from the one foundation, although travelling different ways, the ground colour of the original Rouen being fawn, which is far more easily retained than the blue or slate.

Our duck family is so small that there is plenty of room for the admission of the Blue Orpington, and if breeders persevere they will no doubt get over the difficulty of colour breeding.

As with the Buff Orpington, with an apology, we offer the following standard.

Blue Orpington Ducks.

General characteristics of either sex :—

Head and neck.—Head, massive and broad, with prominent skull. Beak, long, wide, and flat, very strong, and somewhat straight. Eye, bold and bright, and deeply set in the head. Neck, long, medium thickness, not so thick as the Pekin and not so fine as the Indian Runner.

Body.—As wide and long as possible, broad in front and wide across the back, deep in keel, and carrying plenty of breast meat; not too heavy behind. Wings, strong, well feathered and closely carried, not too long.

Tail.—Short, but well feathered, plain in the duck, and curl feather in the drake.

Legs and feet.—Strong, medium length, showing more than in the Rouen, well set, a nice balance, and showing activity.

General shape and carriage.—Not so heavy in pouch as the Rouen, fairly long in body, with large frame, a good keel but not so deep as the Aylesbury, and more active.

Colour in Blue Orpington Ducks :—

Head.—Very dark slate right down the neck, with no white ring as in the Rouen.

Body.—A slatey blue all over as even as possible, wing bar allowed, but must be of the same colour as the body, only it might be permitted to be a darker slate. The breast, however, must be as even slate as possible, and not claret as in the Rouen; the duck ought to be as even all over in slate as possible, including the head, and the neck should be slate right down to the body without any intervention of white, as in the Indian Runner.

Bill.—Bean drab, with a black bean on tip.

Legs and feet.—Rich orange.

Size and weight.—Ducks, 8 to 9 lb., drakes, 9 to 10 lb.

Value of points in judging :—

Defects.	Deduct up to Points.
Defects in head and bill	10
,, tail	5
,, neck	5
,, colour	20
Want of symmetry	20
,, size	20
,, condition...	20
	100

Serious defects for which birds should be passed :—

Crooked back, crooked breasts, wry tail or any other deformity, including slipped wings, claret breast in the drake, or much white in the neck of either sex.

Cayuga Ducks.

The Cayuga is an all-black duck and are very rare in Australia, so much so that we do not know of a single specimen of the breed in the whole continent, nor can we find any advertisement of them in any paper in Australasia. Mr. E. White, of Belltrees, imported some of these ducks from America in 1898, and in 1900 there was a pen of them at the College. They are very well known in America, but not much bred. They are comparatively unknown in England.

They are an American production, and with their black feathering they have never caught on in England. The name Cayuga is given to them by the Americans from Cayuga Lake in Central New York State, where they were first bred. Like all other breeds of poultry, their origin can only be conjectured. Some Americans say they have been bred up from the American wild black duck, while others

Cayuga Ducks. (After Ludlow.)

say that they have been bred from the Rouen by intercrossing of the Black East Indian. They are a very hardy duck, very quick maturing, but are no improvement on the Pekin, which will always be preferred before the Black Cayuga on account of the colour of the down and feather, the black down being objectionable on table ducks. One fault against them is that they often become magpie after moulting out, and do not always breed consistent blacks. They have been bred for many years in America, long before the Indian Runner was known in England, so that, next to the Aylesbury and Rouen, the Cayuga is one of our oldest domesticated breeds of ducks.

Ducks similar to the Cayuga have been known in England for years, but they have generally been of a less lustrous colour, and a good deal splashed with white.

The original Cayugas were imported into England from America in 1871 by the late Mr. J. K. Fowler, of the Vale of Aylesbury. They have been exhibited at English shows for a number of years, but have never been taken seriously for market production. By some market producers in America the claim is made that they can be produced even more cheaply than the greatest of market ducks in America—the Imperial Pekin. But even in America, where the epicures are not as great faddists as their English cousins, they object to the black

feathering, and many people in America say that otherwise they would be very popular and largely bred.

Cayugas are splendid birds for a restricted range and for breeding in suburban yards, where their black colour is a recommendation, in that they do not show the dirt of the city or suburban allotment. They are quiet, docile, and form a strong attachment to their home, evincing no desire to stray. The ducklings are hardy, easily reared, easily fattened, and attain a good size at an early age. The head of the Cayuga is small, the bill rather short and broad, of dark colour, black preferred. The plumage is a brilliant, glossy black throughout. The standard of the poultry clubs of England and of New South Wales is as follows :—

Cayuga Ducks.

Head and Neck.—Head, large. Beak, long, wide, and flat, well set in a straight line with the eye. Eye, full and prominent. Neck, long and tapering, and gracefully curved.

Body.—Long, broad, and deep. Back, broad and long. Breast, prominent. Keel-bone, deep and heavily fleshed, well rounded under-line.

Tail.—Carried well out and closely folded, with two or three curled feathers in that of the drake.

Legs and Feet.—Large and strong in bone, well set, so as to balance the body in a straight line.

Toes.—Straight, connected by the web.

General Shape and Carriage.—Similar in carriage to the Rouen, of a lively appearance.

Size and Weight.—Ducks, 6 lb. ; drakes, 7 lb.

Plumage.—Bright and glossy.

Colour in Cayuga Ducks :—

In Both Sexes.—Beak, slaty black, with jet-black saddle down centre, coming within one inch of the tip, but not touching the sides. The bean black. Eye, black.

Legs and Feet.—Dull orange-brown.

Plumage.—A deep black with a bright and lustrous sheen of green all over, though naturally more lustrous on the wings than elsewhere.

Value of Points in judging Cayuga Ducks.

Defects.	Deduct up to. Points.
Defects in head and bill	10
,, tail	5
,, neck	5
,, legs and feet	8
,, colour	20
Want of symmetry	25
,, size	15
,, condition	12
A perfect bird to count	100

Serious defects for which a bird should be passed :—

Crooked back, wry tail, or any deformity ; orange or dished bill.

The foregoing breeds, viz., the Aylesbury, the Pekin, the Rouen, the Indian Runner, the Buff Orpington, the Blue Orpington, and the Cayuga Ducks, along with the Muscovys, are practically all the varieties that are more or less bred to-day in English-speaking countries for pleasure and for profit.

To make this work as complete as possible, however, a short outline of a few breeds, which can without fear be classed as purely ornamental, and are bred only for pleasure and ornamentation, is included. The most important of these are the

Black East Indian Ducks.

These ducks are very small and are quite useless for profitable poultry breeding compared with the best market ducks. They are hardy and easy, to breed, are very pretty, and make splendid ornaments for small lakes in enclosed grounds. They are very tame, and will breed in the rushes alongside of any pond or artificial lake. They seldom grow larger than 2 lb. weight. They lay very few eggs, which are very small compared with the ordinary breeds of market ducks. The colour of the egg is also somewhat different to other breeds of ducks, being nearly black. These ducks have never been thoroughly domesticated, and although tame in lakes and ponds they will often migrate if given the opportunity to do so. They are supposed to have been first found in South America in the vicinity of Buenos Ayres.

The Black East Indian in shape and habit closely resembles the English Wild Duck (*Anas boschas*), and they will breed freely with them and again *inter se*. They breed largely if left to themselves on large lakes, and make delicious eating when used to the wing, the excellent fineness and flavour of the flesh being exquisite.

The head of the Black East Indian Duck is short and small. Eyes dark hazel, bill rather short. The head of the drake is of a dark yellowish-green, free from all spots or blemishes, and the duck's head is very dark, almost black. The exact colouring of the bill of the drake is considered of the utmost importance. It is described by an enthusiast as being a sort of pale yellow washed over with green. The neck is neatly curved and short, the body plump but small, and the wings powerful. The plumage is a brilliant green sheen throughout, and the smaller the duck the more brilliant the sheen. The ducklings when first hatched are very black in fluff, with a yellow shade on the breast. The legs and feet are jet black.

They are mostly bred for ornament, and are shown for pleasure in England, but are not at all likely to be much bred or exhibited here.

Other ornamental ducks are the Mandarin duck, which is a wild duck of China, but which are also bred by the Chinese in domestication under the name of Li-chi-ki. They are very small and purely ornamental so far as breeding for profit is concerned.

Another ornamental duck is the Carolina, which is an American duck and is crested; it is very small, about the same size as the Chinese Mandarin duck. Then we have the Teals, the Shieldrakes the Pintails, and the Whistling duck, most of which are found in Europe, and the British Isles.

Wild ducks are found in Australia. They are generally called Wild Black Ducks, but they are not black although they are of a very dark colour. In dry seasons they are seldom much seen, but if the

autumn months are wet with plenty of rain to fill the creeks and lagoons, they are met with in large numbers.

The ground colour of the plumage is a dark brown, somewhat resembling the Wild Mallard of Europe. We have also the Wood Duck of Australia, which is also called the Manel Goose from the mane on the neck of feathers of different colour to the ordinary neck feathers. The general body colour is somewhat of a dirty grey, with a brown head and neck, with white spots, and the under parts are mostly of a dirty white. They are very nice eating, but are not met with in such plenty as they were years ago on this continent. The featherings of wild ducks are very pretty, and make splendid subjects for the artist.

We have given a full delineation of all the domestic ducks bred for profit, and a short account of the ornamental. Our next chapter will be the first on the practical side of the question of duck farming.

(*To be continued.*)

Plague Locusts—Experiments at Merriwa.

The Government Entomologist (Mr. W. W. Froggatt), with the assistance of Mr. Cooper, of Merriwa, carried out some experiments with plague locusts in October last on large but isolated swarms of young hoppers.

The first experiments were made with Criddle's compound, a mixture of dry horse-droppings, Paris green, and salt, made up with water and scattered with a shovel from the cart among the swarms. This was very successful, and within two days it was found that it had been devoured by the young hoppers, and immense numbers were lying about among the thistles dead, though there was abundance of green grass all over the country. Mr. Cooper afterwards, at Mr. Froggatt's suggestion, procured a spray pump and sprayed the patches of feeding hoppers with strong kerosene emulsion, and wrote that he was confident that if they were taken in time—that is, as soon as the baby hoppers commenced swarming—they could be very easily cleared off by either method at a very slight cost. Mr. Froggatt further states that he is of opinion that with a cart and a spray pump in such places as Condobolin and other western towns where the grasshoppers or locusts lay their eggs, it would be very easy to kill the bulk of them off in the early stage before they had done any serious damage, without waiting for them to eat poisoned food or become infected with fungus germs. Mr. Froggatt would be very glad this season to have the assistance of persons favourably situated for such experiments.

Seeds and Seed Testing.

(For Farmers.)

C. T. MUSSON,
Hawkesbury Agricultural College.

Part I.

CONTENTS.

Introduction.—What is "good" seed?
Quality.—Age, size, weight, smell.
Relation between quality and amount to sow per acre.
A few general considerations.
- Raising seedlings.
- Fertilizers should not be in contact with seeds.
- Saving own seed for planting.
- Ripe and unripe seed.

Protecting seed against birds.
Seeds and their insect pests.
Seeds and the introduction of fungus parasites to a crop.
Plan of operations in determining the actual value of seed (Home Testing).
- Genuineness.
- Place of origin.
- Condition.—Purity (impurities), vitality.
- Certain seeds require special treatment.
  - Beet and mangel seed-balls.
  - Hard seeds.
  - Hard-shelled seeds.
  - Diseased seed.
  - Grass seed.

Utility value.—After testing, how to determine it.
Germination and purity standards.
How to obtain good seed (purchasing).
The law as it relates to seed selling.
Plan for tabulating results of tests.
Seeds sent to the Hawkesbury Agricultural College will be tested and reported on. (Examples of reports given.)
References in *Agricultural Gazette* to Seed Testing, Good Seed, &c.

ACKNOWLEDGMENT.

The writer has to acknowledge having made use of numerous publications in the preparation of this paper.

INTRODUCTION.

The necessity for using good seed was never more pronounced than at the present time.

The farmer should take the following matters into consideration with respect to seed when arranging for seeding operations :—

1. Suitability for district—as to kind and variety.
2. Freedom from, and resistance to, disease.
3. Quality.
4. Purity.
5. Capacity for germination.

Probably numbers 1 and 3 are attended to by the majority of growers, but it is almost certain that to numbers 2, 4, and 5 but little attention is given.

It is proposed herein to deal with this subject from various points of view, and finally give details as to how seed may be tested at home.

Whilst the modern farmer finds no difficulty in obtaining good seed, and seedsmen do their utmost to supply the very best article, we have seen during the last few years samples of various seeds purchased for seeding purposes that were bad and even useless, or containing weed seed impurities in much greater proportion than should have been the case. There is a growing interest in the testing of seed in this country, but it is not by any means so keen as it should be.

The farmer of all men should be intensely keen in this matter, as good seed is so essential to success, and he can keep his eye on the quality of his seed with very little trouble.

There is clear proof that since testing has come into operation, and publicity has been given to the matter, the general average quality of farm seeds has improved. This is distinctly encouraging and should induce all those interested—the farmer most of all—to prove his farm and vegetable seed in every possible way. The whole of the work in this line is entirely in the interests of the grower.

Profitable farming largely depends on the use of good seed and the non-introduction of undesirable plants through weed seed planted with the crop.

The selection of seed has naturally a most important influence on crops. *Good* seed implies a reasonable proportion of mature seed, true to kind and variety, with only a small proportion (or none) of impurities or adulterants, with good capacity for germination and freedom from insect pests and disease, of at least average size and not old.

The chief causes of seed being poor are careless handling during harvest and afterwards, want of proper cleaning, seasonal circumstances preventing proper ripening, becoming damp from various causes, drying out, sprouting, dirty crops, mixture of old with fresh seed. All these causes should be borne clearly in mind.

The farmers interest in seed testing should be a very real one; he would save considerably in the long run by purchasing good seed. Many admit this, but in large seedings money considerations often stand in the way. Such seed gives larger returns, the resulting product would be superior, all the ground would be utilised, blank spots would not occur, so there would be no patches of bare earth to give weeds their opportunity. Undoubtedly, year in year out, a close attention to this question would save us money and prevent loss in crops; whilst it would be a potent factor in that important work of selection towards the best ends that all growers, consciously or unconsciously, are aiming at.

In selecting seed, appearance, size, colour, plumpness, brightness and smell are good general guides: but appearances are not always reliable.

It is not always easy to judge by eye; something more is needed. A little trouble in the matter is amply repaid. By carrying out a few simple tests we may save considerable expense and loss of time if the seed should not turn out all it claims to be.

Seed is obtained from one of three sources: we may grow, buy, or exchange for it. We either get it on our own place, or obtain it from outside; mostly the latter plan is adopted.

The farmer, to protect himself, should certainly be in a position to know the seed he uses. He can, by the exercise of a few simple methods, examine all seed, and decide for himself as to its value for use. There is no excuse for any man sowing bad seed, for he has the opportunity to get it examined by sending it to this College for the purpose; or he might do it himself with sufficient accuracy for all practical purposes.

Of course it need not be supposed that tests for purity and germination always prove the actual value of the seed. In the case of some seeds, pedigree of the plant may be of greater importance than the germinating power of the seed; for example, a mangold seed with high germinating power might run principally to top, whilst one of less germinating power might grow a better root. Or, again, good seed as to germinating power may in some districts "bolt," or fail to form a root, while the same seed, sown in other districts, will under favourable circumstances produce a good crop. Freaks of nature are not preventable; nor can unfavourable conditions always be overcome. We must not forget that good seed may not have the opportunities necessary for good development.* Moreover it is not always certain that seeds giving a certain test under indoor conditions will germinate equally well when planted in the field. We cannot, therefore, always blame the seedsman for failure of seed.

But for all grass seeds, and, indeed, seeds in general, purity with high germinating power and good weight, will give a pretty safe indication of their actual value. To be enabled to get at these matters accurately, it is absolutely necessary to make a test, accompanied by an examination of the sample, in a certain definite way, to be hereafter described.

Quality in Seeds is influenced by Age, Size, Weight, Smell.

Age.

Old seed is less likely to germinate than new. Loss of vitality is gradual, though more rapid in unripe than in well-ripened seed. With the exception of Cucurbit seed (melon, pumpkin, cucumber, gourd), it is safe to say that new seed is better than old; in fact, it is a mistake at any time to use seed more than two years old, and mostly it should not be more than one. The melon type of seed is better for use at two years than one, as new seed of this plant group will give more vine than is needed and not so much fruit as in cases where second-year seed is used.

* Board of Agriculture, England. Report on conditions under which Agricultural Seeds are at present sold.

Old seed can generally be judged as such by reason of its becoming dull and shrivelled, losing both colour and brightness.

As the result of a long series of experiments relating to the germinating capacity of old seeds, made in America, the average of twenty kinds of seed under vitality tests came out as under, conclusively proving that new seed is better than old :—

	Age of Seed.	Mature.	1 year old.	2 years old.	3 years old.	4 years old.	5 years old.	6 years old.	7 years old.	8 year old.	9 years old.	10 years old.
Average per cent. of twenty kinds of seed.	Per cent. germinated.	74	73	78	65	60	45	42	35	33	30	19

The following table has been given as a guide in this matter :—

(Do not use seed older than stated.)

Wheat ...	2 years.	Turnip...	3–4 years.	Kohl Rabi	3–4 years		
Oats ...	2 „	Swede ...	3–4 „	Clovers	2–3 „		
Barley ...	1–2 „	Mustard	3–4 „	Sainfoin	1–2 „		
Rye ...	1–2 „	Mangold	3 „	Lucerne	3–4 „		
Maize ...	1–2 „	Carrot ...	3 „	Grasses	2–3 „		
Peas ...	4–5 „	Cabbage	3–4 „	Flowers	1 year.		
Beans ...	4–5 „	Kale ...	3–4 „	Vegetables	1 „		
Buckwheat	2 „						

We have successfully germinated lucerne seven years old, and other seed that has also passed the number of years stated. We have also failed to germinate seed presumably fresh and good. Such cases are, however, not common, and can usually be explained as due to exceptional causes.

It may be taken as a fairly correct guide, that seed depreciates rapidly in value the older it becomes.

The tendency for seeds generally is to become weaker in vegetative powers as they age ; as weakness rather tends to fruitfulness, while strength gives vegetative growth, the reason why melon seeds of two or three years old are preferred by gardeners is explained. In most plants we require strength.

It is remarkable that seeds of the common garden stock will, if sown at once after becoming ripe, produce a large percentage of single-flowered plants ; if this seed is kept a few years, a weaker plant is produced with double flowers.

Beet and carrots grown from two-year old seed are said to form better roots ; the plant does not " run."

In chicory and cabbage, grown from three-year old seed, the plants are short and ripen better.

Spinach, lettuce, and radish grown from two-year old seed will run to seed.

Size.

There are great advantages from the use of large plump seed; hence all small seeds should be graded out and should not be used for planting purposes.

"Large plump seed is likely to be more healthy than small, and more likely to produce healthy plants. It can be sown more evenly because of its uniform size (if graded such). It has a larger percentage of growth and fewer failures. Plants from such seeds are larger and thriftier, and more resistant to disease, drought, and starvation. Crops from such seed have a more even growth, and are more economical to harvest and thresh. The yield per plant, both of grain and straw, is greater from such seed. The crop of grain grown from such seed has a higher market value, because (*a*) it contains more large grains and fewer small grains; (*b*) it is plumper and better looking; (*c*) it weighs more per bushel. The continuous use of such seed tends towards a general improvement in the quality of wheat."*

Grain crops derived from small seed give not only a lower yield of grain but a decided inferiority in quality, as the following results, obtained with White Velvet, will show :—

Grade— Seed planted.	Large seed. per cent.	Medium seed. per cent.	Small seed. per cent.
3·25 largest	18·6	13·9	12·4
3·00	34·4	38·7	27·7
2·75	32·2	31·6	38·1
2·50	12·7	12·6	17·0
2·25	1·5	2·3	3·7
2·00 smallest	·3	·6	·9
Tailings	·2	·2	·3

Nor does small seed germinate so well as large. The *failures* in 200 seeds, planted with an average of twenty-eight varieties tested, showed—

Large seed.	Medium seed.	Small seed.
6·2	9·3	17

Taking size of seed from another point of view, it has been shown "that if large seed of radish is used, about 90 per cent. of the crop reaches marketable size; if mixed seed is used, or seed as it usually comes to market, only about 45 to 50 per cent. matures."†

We may certainly conclude, then, that large heavy seeds usually produce more perfect plants than small lighter seeds, and consequently larger crops.

The variation in seeds is considerable, as is well known.

A plan has recently been put forward (V. A. Clark in New York Expt. Stn., Bull., 256), whereby seed can be selected by use of salt solutions. Admitting that heavy seed is best, and that seeds in any lot vary very much in size with a considerable range in specific gravity, the heavy can be separated from the light by using salt solutions of different strengths. The method is ingenious, but is hardly practicable for the farmer.

Weight.

Large seed is usually weighty, though not always so. Weight is an important factor in the selection of seed for planting. The standard per

* Dr. Cobb in *Agricultural Gazette.* † Proc. Am. Assn. Ad. Sc., 1895, p. 285.

bushel for any seed should be known and should be acted up to. Judging the weight by hand is not at all satisfactory, although the practice is commonly followed.

Seed giving light weight per bushel is poor, either in itself or from the large number of blanks therein. The matter of weight should, therefore, have careful attention in all seed selection.

Smell.

This is a good guide for the presence of mould or bunt. Musty seed is to be avoided at all times.

Relation between seed quality and amount to sow per acre.

There is a distinct relation between quality of seed and the amount to sow per acre. The amount required for seeding, as generally stated, refers to good quality seed; and if the seed used is below the standard, then the resulting stand will not be up to requirements. For example, take Prairie grass seed, with a standard weight of 15 lb. per bushel giving a germination test of 80. Now, suppose it germinates only 50; in every 10 seeds there will only be 5 develop plants out of every 8 there should be. This will mean the stand has but little more than half the plants it should have.

Or take a carrot field: the seed should germinate 85 per cent., but seeing that it is seldom this quality of seed is attained, take 70 as a reasonable value; if the seed only gives 40, as is often the case, the crop will carry barely more than half the requirements.

It will be seen, therefore, that a test is really necessary in all cases in order to find out the quantity of seed required to be added to the standard sowing in order to make up for such as does not possess the power to germinate. The standard sowing supposes seed of standard quality; anything below that requires that the amount sown should be increased.

An example will best illustrate the point it is desired to make:—20 acres are to be laid down to lucerne; 12 lb. per acre is to be the sowing. According to the appended table of standards, this seed should give a germination per cent. of 85, with purity per cent. of 98. The standard value is thus $\frac{85 \times 98}{100}$—that is, 83. Seed, should therefore show 83 as the actual value for weight as given. Seed, as tested here, has shown 64 per cent. germination test, 96 per cent. purity test; the value in use of this seed would be, therefore, $\frac{64 \times 96}{100}$—that is, 61. In this case, only 61 seeds would germinate in every 100, instead of 83. Now, the whole point of this is in the fact that if the grower wants his crop to come up with a certain definite covering of the ground, based on the supposition that 83 in every 100 seeds would germinate, if he uses the 61 per cent. seed he must add to the 240 lb. required 60 lb. extra to make up for the proportion that is actually no use. The loss is about one-fourth. He must, therefore, buy 300 lb. at least of the inferior seed in order

to secure the stand required. Of course, if the price is reduced in proportion it will not matter; 8d. a pound would have to be reduced to 6½d. to make things even. A farmer should know all about it, however, before the seed is sown, or he is not able to make up the deficiency shown to exist when the test is made.

Seedlings.

In raising seedlings, wherever there is any danger of insect trouble, as in the case of cabbage and cauliflower being attacked by the characteristic moth grub, the seed-beds may be protected by mosquito netting with advantage.

Seeds to be hand-sown will all bear soaking in water before being planted; the thicker and harder the seed coats, the hotter can the water be. Wattle seed, for instance, will stand being put in boiling water. Seed generally, however, should not be soaked in anything above 135 degrees Fahr.

Seedlings are raised under coloured glass at times, and with success. Red is the best colour to use; it allows of the useful heat rays passing to the soil beneath, whilst the rays having a chemical effect, the blue end of the spectrum are shut out, the red glass acting as a screen to prevent them passing through. Sugar-cane and other seed difficult to germinate may be treated in this way with greater prospect of success.

Fertilizers should not be in contact with Seeds.

In sowing, care should be taken that fertilizers do not come too much into contact with the seed, as in such case germination is poor or entirely prevented. We know one case where a pumpkin patch died out because the seeds were placed directly upon a handful of some chemical fertilizer, the whole being then covered with soil. Naturally enough, the young plants burnt off almost as soon as they appeared above ground. To give the young plants every chance, and prevent possible damage, fertilizers should not be placed near the seed or in drills in too great quantity, except it is well mixed with the soil. In the process of drilling in manure with seed there is sufficient mixture of the former with the soil to prevent damage to seed.

Notwithstanding this, under some circumstances it may be advisable to bring seed into close relation with a small quantity of artificial fertilizer; for instance, to prevent birds eating it, as is mentioned elsewhere.

Saving own seed for planting.

If it is intended to carry this out, certain points should be carefully attended to in the growing of the crops from which seed is to be taken. They should be grown where there will be little chance of crossing detrimentally. Cereals are, with the exception of maize, self fertilized; consequently this remark only applies to the latter amongst them.

Plants likely to cross should be grown as far apart as possible. Seed should be selected from the healthiest plants giving the best return, and not merely be taken from the largest heads of a crop; though grading away all small seed will undoubtedly assist in keeping up the average size.

Seed should be ripe, clean, free from impurities, and dry, and should be properly stored. The proper amount of moisture that seeds can safely lose, and retain their germinating power, is an important matter, a consideration as to which must be left to the expert seedsman. Seed should not be saved from crops infested with disease. Early seed can be selected for early varieties, from middle of ear, which ripens first; even a little before it is quite ripe. For late varieties select after seed is quite ripe, if possible from stalks not dead ripe. Early varieties may be expected to give light returns as there must be long growth for a heavy crop. If own seed has been frequently used, save and exchange it with someone having suitable varieties.

Adopting a regular habit of seed-testing brings the operator into touch with the importance of harvesting seed in first-class condition, so far as is possible to ensure its being ripe, clean, and pure. Such a frame of mind must be distinctly beneficial; the seed-tester proves for himself the benefits that follow use of good seed, and this must necessarily cause him to exercise the greatest care in any harvesting operations he may carry out.

This aspect of the seed question is well worthy of attention. Speaking generally, seed saving should not be entered into except methodically. It is better to leave it, with the necessary cleaning and other operations, to those who are equipped for the purpose, and have the experience.

Ripe and unripe seed.

Mature seed is always best for seeding purposes; it is fully ripe, and under favourable conditions is capable of properly carrying out the functions of germination—a most important matter in the rearing of young healthy plants. Immature seed is such as has not fully developed or ripened before it has been harvested; consequently the germs are not fully formed, whilst the food supply which is to support the germ on its commencing to develop is but poor—the young plants arising from such will lack vigour.

The use of unripe seed in tomatoes, for instance, encourages the production of fruit instead of stem and leaf, and also encourages early production. The resulting fruits and seeds are smaller, though there is an increase in their number. There is a loss of vigour seen in the small percentage of seed that germinate, in weakness of the seedlings, and in the fact that many die before maturity. Full vigour of the plants is never shown, though they produce an abundant harvest, and more rapid development occurs.

As showing the germinating powers of seed at different periods of ripeness, the following is an example, rye being the plant experimented with :—

		Per cent. seeds germinated.
June	26—Plant green, seed watery	4½
July	3—Plant green, seeds large, milky	5
„	10—Straw begins to be yellow, seeds full of starch, green and soft	9½
„	18—Straw yellow and dry, seed hard, not juicy	36
„	30—Straw and grain dry, dead ripe	84

There is something to be done with unripe seed in the matter of raising early varieties.

Protecting seed against Birds.

Birds frequently take a considerable amount of certain seed sown during the first week or ten days after planting. To prevent this, soak the seed in tar water (1 lb. to 100 gallons).

Another method has been given as follows :—"First wet the seed by dipping a bushel or two at a time, contained in a bag, in a tub of water. Allow the grain to remain in the water for a few minutes, so as to get thoroughly wet, then lift the grain and spread it on a clean floor. When the requited quantity of grain is thus prepared, dry it with superphosphate. Seed thus treated when sown will not be pulled up or eaten by birds."

Seeds and their Insect Pests.

Stored seeds are often attacked by insect pests. The cereals find their chief insect enemies in the grain weevil and the grain moth.

These, whilst feeding in the grub state within the seed, do not prevent the seed from germinating unless the germ is destroyed ; but the using up by the insect of the plant food store in the seed is distinctly detrimental to the young plant ; for on germinating, it is thrown upon outside sources for its food supply too early in life, consequent upon its own supply failing ; hence we may expect what really happens—a weakening of the young seedling at a time when it requires all the strength it can get. Further, the opening up of holes in seeds, with accumulation of filth consequent on the insect residing therein, will pave the way for disease germs, such as moulds, soil-residing fungi, amongst them bacteria, to make good a footing, and thus endanger the young plant at a critical stage of life.

The most prominent insects in seeds are, however, the weevils, found in peas and beans. This pest has been giving a large amount of trouble in Canada and certain of the States, where the cultivation of these crops have even had to be abandoned for a time. The insect deposits its eggs on the young pods of growing plants ; the grubs, burrowing into the seed and remaining there, are harvested with the seed, only to spread the pest further on, the perfect beetles coming out to reproduce their kind when the seeds are sown.

We have seen seed exposed for sale in the local stores showing the small circular depressions in the skin which indicate the presence of this insect therein.

All pulse should be carefully examined for this pest, and, if necessary, exposed to the fumes of some poisonous gas in a closed box. Bi-sulphide of carbon is the simplest remedy. The vapour is explosive, therefore care should be exercised in using it. A teaspoonful for every cubic foot of space may be placed in a saucer at the top of the box, in which the seeds to be fumigated have been arranged on shelves, or in some other convenient manner. The vapour sinks, being heavier than air, and envelops the seed. If this is done at night the seeds are ready for use next morning. Steeping in water at 140-150 degrees Fahr. will also kill the insects.

To keep weevils and mice away from seed, pour a little kerosene on it and stir it up well. For moderate quantities this is not expensive, and it is certainly a successful method.

Seeds and the introduction of Fungus Parasites to the Crop.

Many seeds are liable to convey to the ground, thence possibly to the seedling or growing crop, the germs of certain fungous diseases, such as smut and bunt.

For cereals it is advised to steep all seed for a quarter of an hour in hot water at 135 degrees Fahr., or in water in which sulphate of copper (bluestone) has been dissolved (1 oz. to 100 oz. water), for an hour; afterwards the seed should be dried by spreading in cloths, or it cannot be handled properly. Some workers sprinkle a little lime (after slacking) over the seed whilst it is wet. Formalin has been frequently advised as suitable for this purpose, but farmers are advised to continue using the blue stone or hot water method as the simplest and most reliable.

When there is the least doubt as to seed being clean—that is, free from possible fungus attack,—this process should be carried out. In the *Gazette*, Vol. XV, p. 670, Dr. Cobb put forward a scheme for determining with respect to disease germs (spores) on seed whether any are present, and if so the approximate number.

It must not be forgotten that seeds treated by steeping in sulphate of copper are likely to be damaged to some extent by the treatment. Some of them absorb sufficient of the chemical to kill them; this will happen more often where the steeping is kept up for any length of time. To give the seed every chance, and prevent excessive damage from this cause, powdered lime (fresh air-slaked), can be sprinkled over the seed when it is spread out to dry; or after being steeped in bluestone water it can be steeped in lime-water for a few minutes, or the seed can be steeped as a single operation in Bordeaux mixture, which is equally effective in the matter of germ destruction, and has none of the disadvantages attaching to the bluestone solution, if properly made up. With ordinary care, however, the loss of seed is not worth considering, and is certainly of no practical importance.

Whilst some cereals are liable to the attack of smut when well above ground (barley and maize), the main attack comes to the seedling before it has appeared above ground. It may be concluded, therefore, that although steeping the seed will not render all cereals absolutely free from smut, it is a safeguard to steep them all. The cost in cash and time is but light. By doing it the trouble is certainly kept down, and we are doing all we can, so far as present knowledge goes, to minimise this widespread disease. Steeping, if properly carried out, will kill all the germs that are attached to the seed, some of which would almost certainly inoculate the young seedling, if planted with their germinating power unimpaired:

(*To be continued.*)

Hawkesbury Agricultural College.

MONTHLY WEATHER REPORT.

Summary for August, 1905.

Air pressure (Barometer).			Shade Temperature.				Air Moisture 9 a.m. Saturation = 100.			Evaporation (from Water Surface).			
Lowest.	Highest.	Mean.	Lowest.	Highest.	Mean.	Mean for 13 years.	Lowest.	Highest.	Mean.	Most in a Day.	Total for Month.	Monthly Mean for 8 years.	% of the year's Evaporation.
29·72 30th.	30·46 23rd.	30·13	25·8 10th.	79·4 20th.	50·4	51·3	45 22nd.	95 11th.	69	0·203 30th.	2·552	2·132	5·6

Rainfall							Total,	Mean rainfall for 13 years.
Dates	12	25	26	27	29			
Points	3	trace	3	2	3		11 points.	2 inches.

Wind ...	N	NE	E	SE	S	SW	W	NW
	4	11	—	—	4	3	4	7

Thunderstorms on date—26th.

Frosts occurred on dates—3, 5, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 22, 23, 24, 25, 28.

A cold month: only one August (1896) as cold since 1892.

The driest August recorded here; also the driest month since 1892. No three winter months—June, July, and August—have ever given so little rain—a total of 95 points. During these three months there were sixty frosts, giving a long continuous cold, dry period.

CHAS. T. MUSSON,
Observer.

Cotton Seed for Distribution.

The Department of Agriculture has a small quantity of new varieties of cotton seed available for distribution, including Early Carolina Prolific and Extra Long Staple Sea Island, in trial packets. In addition to these two varieties, Mr. John Millis, of Ashfield, has placed some locally-grown acclimatised cotton seed at the disposal of the Department for distribution in small lots. Application should be made to the Director of Agriculture.

Sub-Artesian Water Supply.

W. GIBBONS COX, C.E.

THE subject of sub-artesian boring as distinguished from deep boring for artesian water supply is a question that concerns a large number of pastoralists throughout New South Wales. Mr. W. Gibbons Cox, a well-known authority on boring for water, points out the simplicity of procuring water by this method in detail. The cost is very small compared with deep artesian boring, and the area over which this is practicable is very great in this State. Mr. Cox has had wide experience in this matter, and his article, which follows, should be of service to those whose properties lie within the area of sub-artesian water supply.—[ED.]

The progressive utilisation by boring of the deep artesian supplies of water, which have been proved to exist under enormous areas of country in Australia, especially in New South Wales, Queensland, and South Australia, has given an impetus to well-boring of all kinds, and the last disastrous drought, in raising the question of an increased water supply, has emphasized the vital importance of taking advantage of every source of supply, greater or lesser.

There can be no doubt that there are immense accumulations of water in the rocks and sands of the crust of the earth. Very little of that crust is, in fact, impermeable to water, whether it be by absorption or by pressure from above. What may be the actual quantity of water contained in the earth's crust must remain an unsolved problem. That it is enormous is certain. If it could be restored to the earth's surface it would doubtless raise considerably the ocean level, and encroach upon the lower reaches of the dry land. The passage of water into the crust of the earth has been going on for ages—ever since the cooling of the crust began. The water has, by gravitation, forced its way through the minute interstices of the strata, and it moves laterally through those strata in all directions until it meets a watertight wall or bed, or finds a vent at the lowest level attainable—the shores or bed of the ocean.

A very large portion of the rainfall—the source of all supply—sinks out of sight into the earth in so imperceptible a manner that it fails to impress itself on the mind as regards quantity or other conditions. Whatever the interior of the earth may be, whether solid or fluid, or partially so, the crust is porous. Even the hardest rocks are so constituted; granite itself has a percentage of water in its composition, although water will not pass freely through it. All the softer rocks, especially those of alluvial origin, are water-bearing. The dense compact limestones frequently hold great quantities of water in cavities and cavernous galleries, formed by the decomposition of

parts of the formation by the action of acids in water flowing from the surface. The numerous and successive deposits of alluvial strata, the sands and gravels interspersed with clay, are, as a rule, full of water.

In New South Wales there are many districts in which valuable shallow water has been proved to exist, and is now awaiting further utilisation by the borer's drill. Many of the stock and coach routes are supplied thereby and it may be obtained, notably in the Murrumbidgee-Lachlan basin; in the Cobar district; and easterly from the Barrier, and, in all probability near Broken Hill. In the coastal districts, both north and south, there are great areas of alluvial deposit lying in the "flats" adjacent to, and between, the numerous coastal rivers which are full of water of the best quality, and at exceptionally shallow depths—20 to 50 feet. These waters will prove of inestimable value to dairymen and others under increased settlement.

Sub-artesian water lies, as a rule, in the sands and gravels and newly-formed soft rocks of the post-tertiary, or newest upper, formations. A very large portion of the rainfall has sunk into this formation, and is lying conserved therein. A typical sub-artesian district may be given as follows:—The surface consists of rolling downs. "Weathering," or disintegration, of ranges, during ages of time, has formed, by the action of flood waters, large deposits of alluvial water-bearing strata in great wide stretches of country, which were formerly valleys between successive lines of ridges now showing above the sandy flats.

Grit is a descriptive term for this water-bearing formation, and it varies in its nature. In places it encloses a fine powder which is largely siliceous, and appears to be of volcanic origin. Elsewhere the grit is an aggregation of sand and lime. Then there is the mortar form, enclosing pebbles, quartz, feldspar, diorite, and other igneous rocks. Then the lime matrix almost disappears and we have a heavy conglomerate of water-worn pebbles of the rocks above mentioned, with jaspar, quartzite, and agate. The conglomerate changes at times into beds of a fair quality of water-bearing soft sandstone. There is no doubt that this tertiary grit exists under very extensive areas of New South Wales, and that its character for holding water is continuous throughout those areas. On level country it is covered up by a deposit of tertiary marl which tends to hold down the accumulated waters in the grit. The marl varies from 20 feet or 30 feet to 200 feet in thickness, and the grit from 20 feet to 100 feet. Wherever there are natural springs they are from the grit, and many of the springs might be tapped above their present outlet and their waters made available for extensive gravitation irrigation.

Many of the creeks of the interior are kept flowing by the abounding waters in the tertiary grit. The creeks are merely evanescent flood channels until they are cut down below the grit, and then their channels have a larger flow, except where hidden in sand which is largely the debris of the grit.

The sandy nature of formations—which in a large part of the downs or plains region are noted for their water-bearing capacity—is the main cause of the conditions which allow some of the creek valleys to have a sub-flow of water equal to, or perhaps greater than, that of the visible creeks. The

conditions of hydrostatic pressure under which the sub-flows exist suggest that their movements are directly related to those of artesian wells and springs.

Means of increasing this shallow water supply have suggested themselves to me after many years of close study in this country to the practical operations and bearings of boring for water. One of these is the feasibility of conserving a large amount of the sub-flow described above by forming a dam in a deep trench excavated in a dry season across the bottom of creeks, so as to prevent the passage to waste of a large quantity of the sub-flow from the upper reaches in their vicinity. This sub-flow from large areas of country now finds its way to the lowest level attainable, the bed of the creeks, and passes away. If it were intercepted by a low-level sub-dam it would remain penned up in the ground, and thus maintain a larger and more constant supply for bores in the vicinity to draw upon. It is a common practice to dig for water in the sandy beds of dried up creeks. The water may be found at first at a few feet below the surface, but in a few weeks time, or less, a greater depth is necessary to reach it. As evaporation could not have reduced the water level, it is clear that the level in the bed of the creek, and also in the adjacent country, must have been reduced by drainiage of the water laterally to lower levels, and, in many cases, finally out of the reach of shallow boring.

There must be, in fact, enormous quantities of water in the tertiary formation. The laws that operate in producing the deeper artesian accumulations apply in filling the upper porous strata. The deeper waters have their source mainly in the outcrop of great continuous sheets, or layers, of porous rock, which were originally deposited in the bed of a quiescent primeval ocean, and have since, with other strata, been subjected to geological upheavals and depressions. Some of the rain only that falls passes into the outcropping artesian rocks. A very large proportion falls on the general surface of the country, and sinks into the tertiary formations—the grits—which lie in local sheets, or layers, on the top of impervious clay or other water-tight strata.

Such is the general nature and condition of the shallow water-bearing formation. In many localities much of this valuable water is obtainable by drilling through unpromising strata, such as basalt—"blue stone,"—an accidental deposit of ancient lava, or through layers of limestone, or of hard dry sandstone, or tough compact shales. In many bores, after passing through the usual sand, clay, shales and soft rock, I have struck, at from 80 feet to 200 feet in depth, good and abundant water in the bed of buried creeks, clear evidence of which was shown by the sand-pump bringing up sand, gravel, and waterworn pebbles, and even native-made stone implements, from these ancient watercourses which were still in active operation as of old.

Many shallow bores, from 80 feet to 200 feet in depth, give true artesian "flowing" wells, and since the adoption of the deep-drilling machinery, and a greater exploration of the strata thereby, this has been quite common on many stations in New South Wales and Queensland, in cases where the boring

has been done near the outcrop of the artesian rocks. In many shallow bores the water has risen to within a few feet of the surface, so that by cutting a channel to lower ground the bores have become "flowing" wells.

The proper location of sites for shallow bores is of the greatest importance. Too much guess-work has hitherto prevailed. In fixing upon sites for the deeper artesian bores, maps made by the Mines Department from data afforded largely by the bores carried out, furnish valuable information; but in regard to the tertiary shallow water-bearing country, although likely districts are delineated, much necessary data must be obtained by the well-borers themselves. In examining country, reliance must be placed upon surface indications alone, viz., the lay of the land, the kind of tree growth, the outcrop of rocks and their kind, or surface formations, or rocks partially disintegrated, or entirely decomposed, the proximity of creeks, valleys, and low lying depressions, and the average rainfall of the district.

As it may appear remiss not to mention that long-lived perennial mystery, the "divining rod," in connection with locating subterranean water, especially the shallower, it will be well, without entering into a philosophical discussion of the subject, if indeed its nature would admit of doing so, to call attention to one important fact, viz., that the "science" has not established itself on an acceptable footing in Australia (which has presented a magnificent field for experimenting in), although its professors, past and present, may be counted by scores, and have had every encouragement, and every facility has been afforded them to prove their position. The notion is a very old one, and has had ample time to permanently establish itself if its value was equal to its pretensions. We should, in fact, doubtless have had, ere this, Government divination experts to further facilatate our researches for an increased water supply, and to determine the actual boundaries of the areas of underground water, the delineation of which will, I am afraid, have to be left mainly to the skill of the borers and their drills.

It has been found that, given the general surface indications as described, a well-borer of long experience, by utilising his knowledge and the intuition which has become, by a slow but sure process, natural to him, can locate boring sites with an almost absolute certainty of success, and that in cases where the strata he meets with do not promise well, he knows when to stop expenditure, and to try again further on.

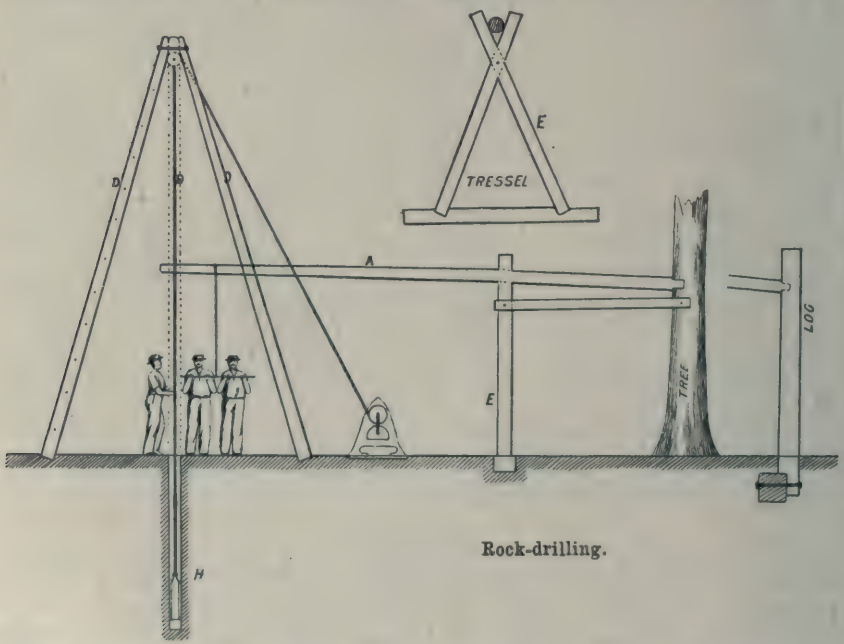
Machinery.

The question of the best mechanical means of getting this shallow water is one which practical well-borers with a large experience in this country, have, I believe, now set at rest. My own decision has been arrived at after many years of practical work and study in thirty-one districts of Victoria, New South Wales, and Queensland—mostly the latter—in boring on stations, and for agriculturists, and for railway purposes, part of the work having been done for the Governments of Victoria and Queensland, respectively. Various types of machines, both of English, American, and Australian make, have been used, all of which have been from time to time, placed in my charge. I

think it will be generally admitted that none of them have proved an unqualified success, the reasons for which have been complication of and too many parts, and a resultant lack of simplicity in the movements, both for boring in alluvial ground and for drilling in rock; liability to breakages in transit and working, or to some hitch or other in the complicated wrought and cast-iron mechanism, with its shafts, wheels, pulleys, chains, spiral, and bevelled screws, steel springs, and all the parts necessary in these systems, to effect the desired end. They require a skilled mechanic to make frequent repairs, and their cost is much greater than necessity requires for the purpose in view. No one will dispute the mechanical ingenuity displayed in their design, but the conditions of work in the bush—the interior of this country—have a law unto themselves, and are very different from those of work in a town or its suburbs.

The simplest, most effective, the quickest in working, and by far the lowest in cost, is a plant made with improvements on the "spring-pole" principle for drilling in rock, and with hand boring rods for alluvial strata.

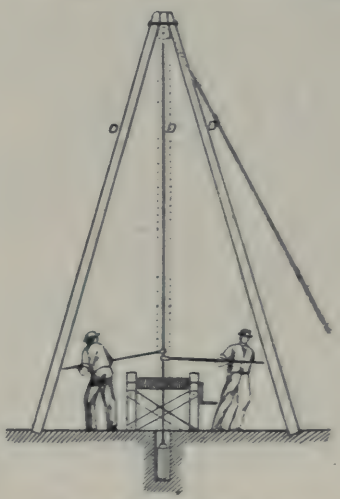
The accompanying illustrations show a side view and an end view of the derrick (D), the borer to start the boring, and the rock-drill at work. The



Rock-drilling.

derrick consists of three poles of bush timber, 20 feet long 5 inches butt, with a bolt through at top, to which are slung a large and a small pulley, working at right-angles to each other for the drill and the sand-pump ropes, respectively to work through from a large (C) and a small winch (B) at the foot. The drilling is done by means of a spring-pole (A), 25 feet long, 5 inches butt, preferably of ironbark, lancewood, or any elastic hardwood. The

butt end of the pole is tenoned and inserted at 9 feet from the ground, into a hole to fit it cut in a tree, or failing that, into a vertical log secured to a cross ground log. At 7 feet from the butt end the pole rests upon a tressel (E), also of bush timber, the height of the tressel being 10 feet, which throws the working end of the pole higher than the butt. A short hanging rope, with a cross-piece of wood forming handles for one or two workmen to pull down upon, is attached to the pole at the working end. Another short rope, also attached to the same end of the pole over the bore-hole, has an iron rope-clamp at the end of it, level with the cross-piece. In drilling in rock-after the cutting chisel, or bit, has been lowered to the bottom of the bore, hole by the large winch, the end of the pole is pulled down, the drill rope is then clamped on to the short rope connected with the end of the pole, the end of the pole let go, when its back spring lifts the drill, the movement being kept up by the workmen pulling down, with little exertion, the end of the pole and again releasing it without letting go the handles.



Boring in Alluvial.

Provision is made under this system by which any requisite power of spring, and lift and drop, may be obtained, and the force, speed, and number of blows per minute (regulated to a nicety by the workmen) are greater than in any other movement—not excepting that of the deep artesian machinery—I am cognizant of or can conceive. After carefully noting the working of the various other machines in use—the movements for lifting and dropping drilling tools,—I have found this spring-pole movement gives from 40 to 50 per cent. more blows per minute than any other, and it is, therefore, the most economical in practice as it is by far the simplest in construction and working. The spring of the pole being direct from the bearing on the tressel (E), is extremely sensitive, and the blows can, as pointed out, be adjusted in every way with the greatest nicety and precision. In rock drilling (I am not now treating of deep artesian drilling) with other machines, the power has to pass from the shaft through wheels, levers, pulleys, &c., before it operates in lifting and dropping the chisel, and in "tightening-up" or "recovery" after the blow has been delivered in order to give another one. The pole, on the other hand, lifts and drops by its own action and spring, direct within itself, the power applied being that of one or two workmen in starting and keeping up, with moderate exertion, the movement, no steam or horse-power being required.

An important feature of this apparatus is that, from its extreme simplicity, the timber work—*i.e.*, the derrick, spring-pole, tressel, and the sand-pump

winch—can all be made in the country of bush timber (the iron work only for these being supplied), the carriage and liability to breakage in transit being thus saved and avoided.

Ordinary wrought-iron boring rods are supplied if necessary for commencing the bore in alluvial ground for not more than say 30 feet, or until hard ground is met with, when the drill is used, worked by the spring-pole.

A sand-pump, consisting of a 5-inch tube with a valve at the bottom for drawing up the cut rock and cleaning out the bore-hole, is worked from the small winch. The large winch is an ordinary quick-movement contractor's winch, with a brake attached, for quickly lowering and raising the drilling bit. The small sand-pump winch is made of bush timber, the iron-work only being supplied. The working tools for rock drilling are identical in every particular with those used in deep artisean drilling, excepting that they are lighter. They consist of a chisel or bit, rimer, sinker-bar, jars, eye-piece for drill rope attachment, undercutting bit, sand-pump, ground-clamp, and clamp spanner, for lifting lowering and turning the casing, casing cap for driving the casing if required, &c., The tubing, or casing, used is the ordinary swelled joint 6-inch artesian.

It will be obvious that although this spring-pole plant is extremely simple in construction and working, it is necessary that the ironwork, including the working tools, be made at a foundry, and that the plant be set up, and started in a district by an experienced borer. Any ordinary workman can then work the apparatus.

The complete plant (excepting poles, tressel, and sand-pump timber winch), with drill and sand-pump ropes for drilling 200 feet, and 30 feet of boring rods, will cost about £50. Weight of the winch and all iron work, including boring rods for 30 feet, complete set of chisels, borer, and other tools, is 1½ tons.

Cracked Heels or Greases in Horses.

In cases where there is no fever, and the inflammation has not extended to the frog, cracked heels or greases may be treated with success without the aid of a veterinary surgeon; in severe cases, and with much local inflammation, fever, and a fetid discharge, a qualified surgeon should be called in. The main consideration in this and similar complaints is cleanliness and the guarding against circumstances favourable to the production of the disease. Pure air, a nourishing diet, and regular exercise are essential to success. At the outset, benzoated oxide of zinc, Condy's fluid, or an astringent lotion of sulphate of zinc, 3 drachms to a pint of water, may be used. If the surface is much swollen, a poultice of linseed meal or bran will help matters along. If horses' legs are washed or, after work, sweat is allowed to run into the heels without being dried, cracked heels frequently result. Some horses are predisposed; with such animals, additional care should be taken to give immediate attention. A bran mash or a mild laxative will assist in effecting a cure.

Irrigation.

A Few Hints on the Preparation of the Land and the Practical Application of Water.

F. G. CHOMLEY.

There are many localities in New South Wales where supplies of water in sufficient quantity for irrigating purposes exist that are, unfortunately, not made use of. Thousands of cubic feet of water, running to waste from artesian bores, and millions of cubic feet are flowing to the sea in rivers; besides these large sources of supply there are many favourable places for the utilisation of wind-mills, oil-engines, and steam-pumps, but the methods of obtaining a supply of water is not the purpose of these notes, but rather to put in a simple manner a few hints, that may be of use to those who are fortunate enough to have a supply available, and who are not yet making use of it.

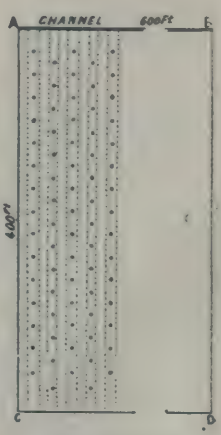
Preparing the Land.

It is assumed that the supply, from whatever source it is obtained, be it a public supply, pumped from tank, stream, or dam, &c., is available in sufficient quantity for the area to be brought under irrigated culture, and that it is delivered at the highest point on the land to be treated.

If the crop to be grown is one that is cultivated in rows, such as fruit-trees, vines, corn, or other crop, the most approved practical method of supplying water to them, is by means of furrows, and in the case of orchards, the deeper the better; in California, recent experiments have shown that furrows up to 12 inches in depth have given better results than shallow ones.

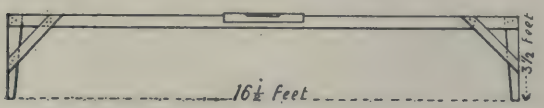
The most important thing at the outset is to prepare the land in a proper manner, in some places very little work is required, the land naturally having a suitable grade, but in cases where the grade is not suitable certain work must be performed to overcome this. Perhaps the clearest way of demonstrating this will be to take a specimen piece of land and trace the work from start to finish.

Suppose A, B, C, D, is a piece of land, the area about 5 acres, to be prepared for irrigation, and to be planted with fruit-trees. The supply is available, say, at A, the highest point, and that

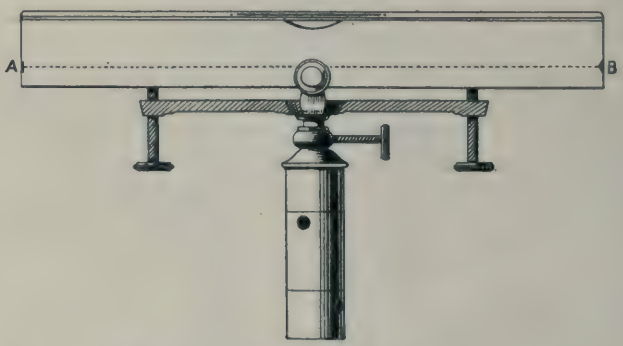


Plan of Orchard.

there is a fall from A to B of, say, 3 feet, and from A to C of, say, 1 foot, and from A to D of 4 feet—these levels could be obtained by employing a surveyor, or they could be obtained in a simple way by using a form of A level —the A level is generally made of three battens, in the shape of the letter A, and a plumb-bob is suspended from the uppermost point, to swing vertically opposite a mark on the cross-piece when the two feet are level ; however, a more satisfactory and quicker level can be made as shown in the illustration. This level is quite accurate enough for small areas if a little care is taken in its use. Channels can be laid out and contours run by its means. A cheap form of tank-sinkers' or road-makers' level, obtainable at a cost of 15s. to 20s., somewhat similar to the illustration, mounted, at a convenient height, on a stake driven into the ground, will be found very handy ; as sights of $2\frac{1}{2}$ to 3 chains can be made with sufficient accuracy for this class of work. A light staff 10 feet long of 3 inches x 1 inch batten with a scale of feet and inches painted on its face in black on a white ground is required with such an instrument, and a bagful of pegs to mark the levels.



Modified A level, showing how an ordinary level may be used.



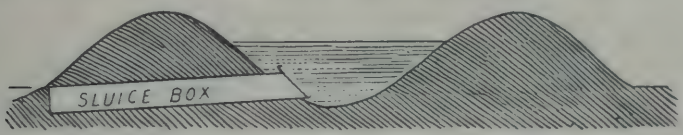
Road-makers' or Tank-sinkers' Level.

In the specimen piece of land, the best position for the head-ditch will be along A B, the furrows to run in the direction shown. A distance of 400 feet is quite long enough to run water in furrows for irrigation. A good wide headland should he left along the top of the orchard, allowing at least 4 feet for the ditch and 20 feet—24 feet would be more satisfactory—from the ditch to first row, making a headland 24 to 30 feet wide. With a narrow headland, the banks of the ditch and the sluice-boxes get broken by the horses turning on them when ploughing and cultivating.

It is advisable, in order that a good strong ditch can be formed, to draw some earth by means of the buck-scraper (see *Gazette*, March, 1905) from the field to make a slight bank along A B so that the banks of the ditch will be substantial and of a round form that can be walked on and not likely to

fall away. The ditch can be roughed out with a plough, and cleaned up to the section shown in the sketch with shovels. In a small permanent ditch there is no use for a crowder or other mechanical device for channel making; these implements are useful on larger undertakings, or in connection with irrigating cereals on a large scale.

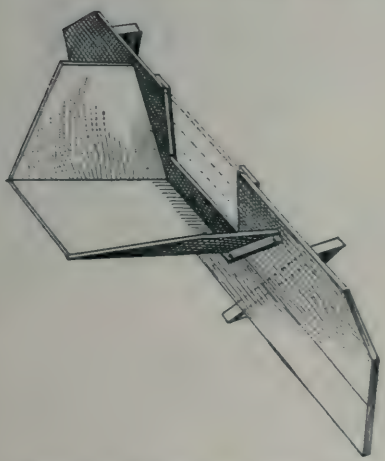
The size of the head-ditch depends on the amount of water available. A good size in this case would be 1 foot 6 inches wide on the water line. As there is a fall from A to B of 3 feet, it will be necessary to regulate the flow



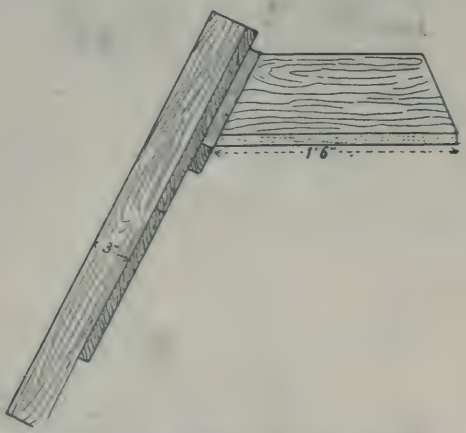
Section of head-ditch, showing sluice-box in position.

in the ditch by means of "drops" or small weirs; these can be made of sand-bags, or, more permanent ones, made of wood or concrete; a "drop" should be placed along the ditch every 6 inches of fall. This will enable the flow of water to be regulated so that every furrow can be kept running, or as many of them as are necessary or the supply will permit.

A serviceable "drop" for earth channels is shown in the sketch, precise dimensions are not given, for the simple reason that the drop must fit the channel, it should come well into the banks, and be fairly deep; this depends



Wooden drop with apron for the water to fall on.
The dotted lines show regulating boards.



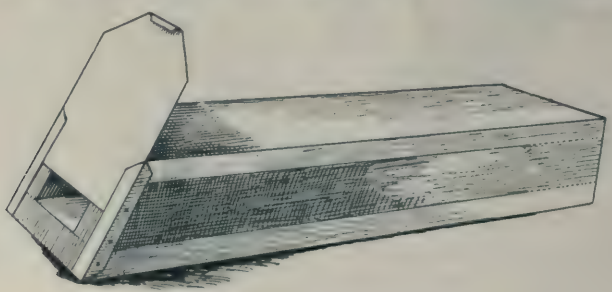
Side view of wooden drop and apron.

on the kind of soil. If they are built on the batter, that is, with a slant on them, the damp earth in drying after irrigation does not come away from the timber and leave cracks, a source of great trouble when next irrigating commences; the apron should project just far enough to prevent the falling water scouring a hole in the channel. If the channel is to be lined with concrete,

and this is strongly recommended, the drops can be worked in the material, no apron for the water to fall on is then necessary, nor is any wood, as is shown in this illustration, desirable, as the wood swells when wet and cracks the concrete; grooves for the depth boards can be cast in the concrete.

A concrete channel with gauge boards and drops.

Now comes the question of getting the water out of the ditch in small streams, by which means only can furrow irrigation be carried out. As a makeshift cuts can be made in the bank with the shovel, and choked with weeds



Sluice-box with regulating slide.

to regulate the water to a small stream, but it is far more economical to have sluice-boxes that can be controlled. The simplest form the writer has experience of is of the form shown in the illustration, a square wooden pipe is made of red gum or any good lasting wood, 4 inches square and

4 feet long, from two lengths 4 x 1-inch, and two lengths 2 x 1 inch stuff nailed together, and cut in half on the slant, making an angle about 30 degrees to the perpendicular. On each side of the pipe at the slanting cut-end a piece of galvanised-iron, bent in the form shown, is nailed with small flat-headed nails. This makes a spring guide to carry a flat galvanised-iron slide. As the saw-cut must leave a flat surface the flat iron slide fits tight, while the springy guides maintain it in position. Any man who

Orchard in process of being irrigated.

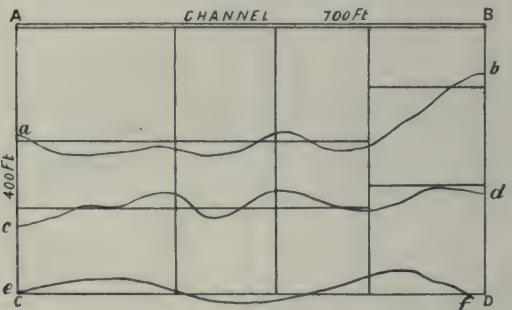
can drive nails and use a saw can make these very quickly. This size gives a clear hole 2 inches square, and about 2 feet long, but a smaller hole is generally sufficient.

This completes the fitting of the channel. If the level shows any hollows lying in the direction in which the water is to run, or any hills over which the water will not go even when a furrow is drawn, these must be reduced by means of the buck-scraper and smoother described in the *Gazette*, March, 1905, but with such a fall it is not likely that much of this work will be required—especially when the depth of the furrow is taken into account; before starting to plant, test the land with water to find out how the levels are, by ploughing furrows every 20 feet apart and letting water along them, marking any places with stakes requiring filling in or reducing; it is easier to grade land before planting than after.

In irrigating any crop such as fruit-trees, vines, maize, &c., where furrows are used to carry the water care must be taken to let the rows from top to bottom get an equal supply—a bad irrigator will have the growth heavy at each end and stunted in the middle—run a fair stream down the furrow, say half way, and then close down with the slide to a trickle that will take some time to reach the bottom. By cutting one furrow into another and regulating the sluices an even wetting without any flooding of the surface (which is very harmful) can be achieved.

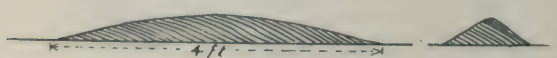
Preparing Land for Irrigation in Checks.

Should the nature of the crop necessitate the flooding of the land such as is the case with lucerne, &c., it will be as well to choose land as near level as possible with a gentle fall one way. Suppose, for instance, the piece of land is shaped like the piece in the illustration.



Rough plan, showing contour lines and proposed checks.

With the level it is found that A B is nearly level, the fall from A B to C D is 9 inches. Starting at A, work along A C till 3 inches of fall is shown at *a*; then from (*a*) work along this level—marking by stakes, or lockspits made with a shovel — then work along A C till it shows 3 inches further fall at (*c*); contour again towards B D; repeat, starting at (*e*). In setting out checks, 3 inches is a good difference in level to make contours; if less, trouble in grading with scoop or buck-scraper will be found; if more, there is too much earth to move, making the work very expensive. Having these levels marked on the ground, make a rough sketch to scale, and plan out divisions for banks, keeping the checks rectangular and of about equal area, if practicable, and not more than half an acre each. It is a mistake to have the checks too large; water is wasted and the crop does not receive an even supply. The lines of division being decided on, mark them out, and with the buck-scraper draw soil from the high to the low portions to level the land and form the retaining banks. The banks should be flat, 6 inches in height by 3 to 4 feet wide, so that mowers and rakes will work over them.



Section of a good bank. **Section of a bad bank.**

The supply-ditch should run along A B, with sluices leading into each of the top-checks, and from these checks cuts should be made, or permanent sluices made of wood, provided to let water into the lower ones in order; these, however, are often in the way of machinery. With low banks, such as described,

with each check very nearly level and not too large, very even distribution can be effected. Provision should be made to allow any water not absorbed in twenty-four hours to escape, as considerable harm will result by scalding &c., if allowed to remain.

In practice, many little difficulties will present themselves, to enumerate all the troubles possible to meet is the work of a pessimist. In California, and Mildura, Victoria, every conceivable obstacle has arisen; and has been for the most part overcome. At one time, in California, when water was of less value than now, most extravagant waste took place (as is the case in Victoria now), the result being in many cases ruination of the soil; the present tendency is less water and more cultivation, the result being better crops and a great saving of water. Owing to the cost of materials in Australia, few, if any, of the systems of pipe irrigation can be adopted. Iron is used in California in conjunction with canvas duck hose, pipes being 8 to 9 inches in diameter; cement pipes are also used, being cast in moulds, and laid below the surface, out of the way of ploughing. Wooden flumes, made of Redwood, are also in vogue, but there is no suitable Australian wood for this purpose; the ordinary hardwoods warp and shrink too much. Concrete on a wire-netting foundation—on the Monier system—has given good results in Australia. Concrete channels (as used at Mildura) are built in position, the ditch being formed carefully, and the concrete laid on like mortar, and dressed to size by a gauge. The proportions are:—

Lime	5 bushels.
Sharp sand and gravel (lime-stone rubble) ...	1½ cubic yards.

In the Bacchus Marsh district of Victoria, where the soil on the river flats used for lucerne is very porous, calico hose is largely used, and seems the only method possible under the circumstances. The hose is led from the head-ditch across the lucerne field; the hose is in handy lengths, and is joined together by inserting one piece into another about 3 feet; the slight pressure on the hose keeps the join tight. As an area is treated, the attendant removes a length and leaves it a few yards to one side to be joined up for the next row; a long pole with a hook is used to move the outflow end as the soil gets too soft to carry a man.

Too much scoop work should not be done to level land for flooding, unless there is a great depth of soil: better have more check banks and smaller checks than patches of subsoil in the area.

There are a few points in connection with water and water supply that might be touched on that may be of some use to those who are giving attention to utilising the water now running to waste. The first thing that confronts one is the unsatisfactory reference to miners' inches, gallons per diem, cubic feet per second, &c., all mixed in the most bewildering way, that gives absolutely no idea of the amount of water in question to the ordinary man. Artesian bores are generally spoken of as giving flows of so many million or thousand gallons per twenty-four hours: the flow of rivers is given in cubic feet per minute or second; while in California the water supply for irrigation is spoken of and sold by miners' inches—a variable quantity, depending on many circumstances—the seller's idea changes as water gets scarce. In

larger schemes the term acre-feet (for water at rest) has come into use; this is a good, sensible, easily understood unit Anyone can grasp what an acre of land, covered 12 inches deep, means.

It would, however, be more satisfactory if all measures of flow were expressed in cubic feet per second. We would then get used to reckoning in these units, and when a flow of 50 or 100 cubic feet per second was mentioned, we would have some idea of its volume and value.

In many text-books and articles on irrigation emanating from California, the miners' inch is used as a measure of flow. This, no doubt, has arisen from the fact that mining preceded irrigation on ranch and farm in that and adjacent states, and the miners used the inch measure as a rough and ready way of dividing streams for sluicing and other mining purposes. The accepted standard for the miners' inch in California and Colorado is the amount of water that will flow through an inch square hole in an inch board, under a 4-inch head, and has been found by trial to yield about one-fortieth of a cubic foot per second, or, by calculation for this class of orifice = ·0231 cubic feet per second. In practice, a 50-inch stream, or head, would be in excess of the supply due on the above basis, as the means of measuring a 50-inch stream is not subject to the same conditions, as a slot about 2 to 2½ inches wide and 25 or 20 inches long is used, the head varying from 4 to 7 inches. When water is scarce, the miners' inch shrinks to about one-fiftieth of a cubic foot per second—thus no great reliance can be laid on any measurements given in miners' inches.

When a 50-inch head is spoken of, it generally (or at least in the portions of California around Riverside) means a fair stream to irrigate 10 acres of orchard in twenty-four to thirty-six hours, and will, approximately, equal 2 inches deep all over the area.

Keeping in mind that 1 cubic foot per second, or 60 cubic feet per minute, is equal to a covering of 2·37 inches—say 2⅓ inches—of water on ten acres in twenty-four hours, we have a simple unit that is neither hard to conceive nor remember.

The Imperial gallon is equal to 1·2 U.S. gallons; 6·24 (say 6¼) Imperial gallons, or 7½ U.S. gallons, are equal to 1 cubic foot; thus when the amount of water used on American farms or orchards is given in gallons it should not be forgotten that this difference exists.

One inch of rain on an acre of land is equal to 22,620 Imperial gallons, or roughly 23,000 gallons. One cubic foot (or 6¼ gals.) per second flowing constantly may be considered as capable of irrigating about 200 acres of cereals, or 400 acres of orchard or vineyard, providing the annual rainfall is not below 15 inches—lucerne takes far more water than either cereals or orchard—the loss from evaporation being greater, apart from the extra amount of produce grown, and the fact that the water is mainly required during the late spring and summer.

Articles on Irrigation have appeared in the *Gazette* at various times, to which the reader is referred for much useful information. (*Vide Agricultural Gazette*, vol. X, 1899, pages 717 and 1268; vol. XI, 1900, page 521; vol. XIV, 1903, pages 385, 1090, 1143; vol. XV, 1904, pages 353, 637, 807.)

A List of the Insectivorous Birds of New South Wales.

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Part VI.

In Volume XIII, p. 407, 1902, of the *Agricultural Gazette*, the remainder of the species of the strictly insectivorous birds of New South Wales was enumerated. The second section of the subdivision consists of those birds inhabiting the State which are only partially insectivorous, but generally useful. The concluding section enumerates a list of birds also partially insectivorous, but likewise frugivorous, or granivorous, and all more or less harmful.

Section II.

BIRDS PARTIALLY INSECTIVOROUS.—GENERALLY USEFUL.

120. Podargus strigoides, *Latham.* Tawny-shouldered Podargus, or "Frog-mouth."

Podargus humeralis, Gould, Bds. Austr., fol. ed., Vol. II, pl. 3 (1848).

Podargus strigoides, North, Nests and Eggs, Austr. Bds., p. 26. pl. VI, fig. 3 (1889).

This species, known to many residents in the country by the local and erroneously applied name of "More-pork" or "Mopoke," is freely dispersed over most parts of New South Wales. It is a quiet and inoffensive species, and is usually met with during the day asleep and perched across or along a branch, or in the thick forked stem of a *Eucalyptus* or *Casuarina*. The food of the Tawny-shouldered Podargus consists of various species of mantis, locusts, beetles, and all kinds of nocturnal insects; to this diet is added small frogs. It is a most useful bird and should be rigorously protected. The nest of this species is usually a loosely-built structure of thin sticks placed across the horizontal branch of any suitable tree. Eggs, two or three in number for a sitting, elliptical in form, and pure white.

121. Podargus plumiferus, *Gould.* Plumed Podargus.

Podargus plumiferus, Gould, Bds. Austr., fol. ed., Vol. II, pl. 6 (1848).

A rare species found only in the scrubs and brushes of the northern coastal districts of the State.

Note.—Contributions from the Australian Museum, by permission of the Trustees.

122. DACELO GIGAS, *Boddaert.* Great Brown Kingfisher, "Laughing Jackass," "Laughing Kingfisher."

Dacelo gigantea, Gould, Bds. Austr., fol. ed., Vol. II, pl. 18 (1848).

Dacelo gigas, North, Nests and Eggs, Austr. Bds., p. 36, pl. VI, fig. 1 (1889).

A familiar and well-known species frequenting open forest country and the timber-clad mountain ranges of eastern New South Wales. In the dry western portions of the State it is only met with in the neighbourhood of rivers and watercourses, or wherever there is permanent water. For the purposes of breeding it deposits its beautiful pearly-white eggs, which are three or four in number for a sitting, on the decaying wood in the hollow limb of a tree. Insects form only a portion of this bird's food, but it is useful in ridding the country districts of rats, mice, lizards, centipedes, and occasionally small snakes. It will also pounce down and capture young chicken. When the latter have the run of the bush, entire broods have been destroyed in the outlying suburbs of Sydney. The contents of the stomachs of many birds of this species I have examined proves that lizards is the staple article of their diet; but the food varied according to the different situation and features of the district in which the specimens were obtained.

123. HALCYON SANCTUS, *Vigors and Horsfield.* Sacred Kingfisher, Common Tree Kingfisher.

Halcyon sanctus, Gould, Bds. Austr., fol. ed., Vol. II, pl. 21 (1848); North, Nests and Eggs, Austr. Bds., p. 37 (1889).

A partial migrant arriving in New South Wales in August and departing again at the end of February; stragglers are, however, occasionally met with during the intervening months. It usually deposits its fine pearly-white eggs on the decaying wood in the hollow branch or hole of a tree, or in a chamber hollowed out at the extremity of a tunnel it excavates in the nest of the white ant. The food of this species varies according to the class of country it frequents. Inland, where this species is far more freely distributed, it consists principally of insects and their larvæ and small reptiles. Near the coast, crustaceans form its chief article of diet, like that of its Queensland congener, *Halcyon sordidus*.

124. HALCYON PYRRHOPYGIUS, *Gould.* Red-rumped Kingfisher.

Halcyon pyrrhopygia, Gould, Bds. Austr., fol. ed., Vol. II, pl. 22 (1848).

Halcyon pyrrhopygius, North, Nests and Eggs, Austr. Bds., p. 38 (1889).

The Red-rumped Kingfisher is a summer visitant to the inland portions of New South Wales. It frequents most arid situations, and is seldom met with except for the purposes of breeding in the vicinity of water. This Kingfisher excavates a tunnel in the side of a dam or old disused saw-pit, and at the end deposits four pearly-white eggs in a chamber hollowed out for their reception. Its food consists of insects and their larvæ and small reptiles, principally lizards.

125. Halcyon macleayi, *Jardine and Selby.* Macleay's Kingfisher, Bush Kingfisher.

Halcyon macleayi, Gould, Bds. Austr., fol. ed., Vol. II. pl. 24 (1848); North, Nests and Eggs, Austr. Bds., p. 38 (1889).

This species is found only in the rich brushes of the northern coastal districts. It breeds principally in the nests of the white ant; the eggs are five in number for a sitting, of a beautiful pearly-white when fresh. The food of this species consists of insects and their larvæ, and small reptiles.

126. Cinclosoma punctatum, *Vigors and Horsfield.* Spotted Ground Thrush.

Cinclosoma punctatum, Gould, Bds. Austr., fol. ed., Vol. IV, pl. 4 (1848); North, Nests and Eggs, Austr. Bds., p. 151, pl. XI, fig. 10 (1889).

A resident species found in most parts of the State. It is usually met with in scrubby localities, or in lightly timbered country with a slight undergrowth. The nest of the Spotted Ground Thrush, which is built upon the ground, is a loosely-built structure composed of strips of bark, grasses, and leaves, and is usually well concealed under a clump of bracken fern, or in the low undergrowth in close proximity to an old stump or fallen tree. Eggs, two or three in number for a sitting, of a dull white, thinly freckled or heavily blotched with umber-brown, wood-brown and violet-grey markings, the latter colour usually appearing as if beneath the surface of the shell. Insects and their larvæ obtained among fallen timber, berries, and seeds constitute the food of this species.

127. Cinclosoma castaneonotum, *Gould.* Chestnut-backed Ground Thrush.

Cinclosoma castaneonotum, Gould, Bds. Austr., fol. ed., Vol. IV, pl. 15 (1848).

In habits and mode of nidification the Chestnut-backed Ground Thrush resembles the preceding species. It is, however, a rare species in New South Wales, its range being restricted to the dry scrubby localities of the western portions of the State.

128. Geocichla lunulata, *Latham.* Mountain Thrush.

Orcocincla lunulata, Gould, Bds. Austr., fol. ed., Vol. IV, pl. 7 (1848).

Geocichla lunulata, North, Nests and Eggs, Austr. Bds., p. 171 (1889).

This species frequents the humid scrubs and slopes of mountain ranges of eastern New South Wales; it passes most of its time upon the ground, searching among the fallen timber and moss-covered stones for various kinds of insects and their larvæ, small molluscs, and worms, which constitute its food. The nest of the Mountain Thrush is usually built in the thick fork of a tree; it is a round open structure composed of thin strips of bark and mosses, lined with fibrous roots, the rim of the nest being very thick and neatly rounded. The eggs are five in number for a sitting, and vary from a light stone to a greyish-green ground colour, and are minutely freckled all over with reddish-brown markings. This species commences to breed in July, and continues the five following months.

129. Leucasarcia picata, *Latham.* Wonga Pigeon.

Leucasarcia picata, Gould, Bds. Austr., fol. ed., Vol. v, pl. 63 (1848); North, Nests and Eggs, Austr. Bds., p. 272 (1889).

This fine pigeon frequents the rich brushes and mountain ranges of eastern New South Wales. Seeds and berries constitute the principal portion of this bird's food during the summer and autumn months, but in the early spring it feeds largely upon dipterous larvæ, which are all known to be very destructive to grass. The nest of the Wonga Pigeon is a flat structure of sticks and twigs placed crosswise on the horizontal branch of a tree, and is usually built at no great height from the ground. Eggs, two in number for a sitting, pure white.

130. Eupodotis australis, *Gray.* Australian Bustard, "Native Turkey," "Plain Turkey."

Otis australasianus, Gould, Bds. Austr., fol. ed., Vol vi, pl. 4 (1848).
Choriotis australis, North, Nests and Eggs, Austr. Bds., p. 296.

A well-known species sparingly distributed over the inland portion of the State and much sought after as an article of food. It lives on grasses, seeds, and insects to a large extent. This bird usually lays one, sometimes two eggs for a sitting, of an olive-brown, spotted and blotched, with markings of a deeper hue.

131. Œdicnemus grallarius, *Latham.* Southern Stone Plover, "Bush Curlew," "Stone Curlew."

Œdicnemus grallarius, Gould, Bds. Austr., fol. ed., Vol. vi, pl. 5 (1848); North, Nests and Eggs, Austr. Bds., p. 297, pl. xix, fig. 3 (1889).

This bird, from its peculiarly mournful note, which is uttered at night and resembles "Koo-loo," is better known to most residents in the country districts of New South Wales under the local name of "Curlew." Care, therefore, must be taken not to confound it with the true Curlew (*Numenius cyanopus*) of the coast, a bird generically and specifically distinct. The Southern Stone Plover evinces a decided preferences for open forest country or grassy plains. It deposits its eggs, which are two in number for a sitting, upon the bare ground. In addition to insects of various kinds, small frogs, land molluscs, and worms form the principal portion of this bird's food. This species is often kept in gardens and orchards to clear them of grubs, snails, &c.

132. Lobivanellus lobatus, *Latham.* Spur-winged Plover, "Alarm-bird."

Lobivanellus lobatus, Gould, Bds. Austr., fol. ed., Vol. vi, pl. 9 (1848); North, Nests and Eggs, Austr. Bds., p. 300 (1889).

A common species in New South Wales. It frequents alike the margins of swamps and shallow lakes, open grass lands, and the dry plains. Grasshoppers and worms, and small aquatic insects obtained from the edges of

swamps, constitute this bird's food. The Spur-winged Plover usually breeds during August and the two following months, depositing its eggs, four in number, upon the bare ground. The eggs vary from olive-brown to olive-green in ground colour, and are uniformly spotted and dotted with deep blackish-brown. This bird uses every device to attract one away from its eggs or young, by feigning lameness or a broken wing, uttering all the time loud notes of distress. A very useful species to keep in a garden.

133. Sarciophorus pectoralis, *Cuvier*. Black-breasted Plover, "Plain Plover."

Sarciophorus pectoralis, Gould, Bds. Austr., fol. ed., Vol. vi, pl. 11 (1848); North, Nests and Eggs, Austr. Bds., p. 302, pl. xvii, fig. 6 (1889).

A plain inhabiting species widely distributed over the inland districts of the State. It usually commences to breed in August and continues the two following months, but like many species of grallatorial birds, the breeding time of the Black-breasted Plover is greatly influenced by the wet season being early or late. After an excessive rainfall at the end of autumn, the eggs of this and many other species of *Charadriidæ* are found as early as May. The eggs of this plover, usually four in number for a sitting, are deposited in some slight depression in the ground, or on the top of a small mound a few inches above the level of the surrounding plain; they are of a light olive-brown ground colour, thickly spotted and dotted with different shades of brown, and a few indistinct subsurface markings of bluish-gray. The food of this species consists of worms and the various kinds of insects found upon the plains and grassy flats which it frequents.

In addition to those enumerated above, several species of hawks, owls, ibises, and the silver gull devour large numbers of insects at certain seasons of the year.

Section III.

III.—BIRDS PARTIALLY INSECTIVOROUS, FRUGIVOROUS, AND GRANIVOROUS—MORE OR LESS HARMFUL.

134. Strepera graculina, *White*. Pied Crow-Shrike, "Black Magpie," "Fruit-eating Magpie."

Strepera graculina, Gould, Bds. Austr., fol. ed., Vol. ii, pl. 42 (1848); North, Nests and Eggs, Austr. Bds., p. 55 (1889).

The present species is freely dispersed throughout the mountain ranges and open forest lands of New South Wales. Berries and fruits constitute the principal portion of this bird's food during the summer months, and the larvæ of insects to no small extent in autumn and winter. The Pied Crow-Shrike, or "Black Magpie" is, however, better known to orchardists and agriculturists by the depredations it commits in fruit and grain crops; consequently a merciless warfare is waged against it, but without any apparent diminution in its numbers. The nest of the Pied Crow-Shrike,

which is usually built in a Eucalyptus or Casuarina, is a large open bowl-shaped structure outwardly composed of sticks, and lined with strips of bark and grasses. Eggs, three in number for a sitting, of a pale chocolate brown, faintly spotted and blotched with vinous brown markings.

135. STREPERA CUNEICAUDATA, *Vieillot.* Grey Crow-Shrike, "Grey Magpie."

Strepera anaphonensis, Gould, Bds. Austr., fol. ed., Vol. II, pl. 45 (1848).
Strepera cuneicaudata, North, Nests and Eggs, Austr. Bds., p. 55.

Although fruits and berries form portion of this bird's food, it seldom enters into orchards and gardens in search of cultivated fruits as does the preceding species.

136. GRAUCALUS MELANOPS, *Latham.* Black-faced Graucalus, "Blue-Pigeon," "Blue-Jay."

Graucalus melanops, Gould, Bds. Austr., fol. ed., Vol. II, pl. 55 (1848); North, Nests and Eggs, Austr. Bds., p. 74, pl. IX, fig. 4 (1889).

A fairly common and widely-distributed species, found over most parts of the State. Insects of various kinds constitute the principal portion of its food, but it commits depredations in orchards and vineyards.

137. GRAUCALUS MENTALIS, *Vigors and Horsfield.* Varied Graucalus, "Smaller Blue-Jay."

Graucalus mentalis, Gould, Bds. Austr., fol. ed., Vol. II, pl. 56 (1889); North, Nests and Eggs, Austr. Bds., p. 75 (1889).

Similar in habits to the preceding species, but not so frequently met with.

138. CORCORAX MELANORAMPHUS, *Vieillot.* White-winged Chough, "Organ-bird," "Black Magpie."

Corcorax leucopterus, Gould, Bds. Austr., fol. ed., Vol. IV, pl. 16 (1848).

Corcorax melanorhamphus, North, Nests and Eggs, Austr. Bds., p. 189 (1889).

The White-winged Chough is freely distributed over most parts of New South Wales, but is more frequently met with inland than near the coast. The nest of this species, in which often several birds assist in its construction, is a large bowl-shaped structure of mud with a slight lining of dried grasses or decaying bark fibre, and is built on the horizontal branch of a tree, in any convenient situation. The eggs are usually four or five in number for a sitting, but as many as eight have been found, probably the result of two females depositing their eggs in the same nest. The eggs are dull white, blotched all over with olive and blackish-brown markings, while beneath the surface of the shell appear many deep bluish-black spots or blotches. The food of this bird usually consists of insects of various kinds. Mr. A. M. N. Rose, of Campbelltown, however, informs me that in the neighbourhood of Blacktown, this species has been frequently trapped and shot while attacking and eating the maize.

139. Corone australis, *Gould.* Australian Raven.

Corvus coronoides, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 18 (1848).

Corone australis, North, Nests and Eggs, Austr. Bds., p. 187, pl. vii, fig. 7 (1889).

A common and well-known omnivorous species found all over the State. It is useful in ridding cleared lands of large numbers of insects and grubs, but it is very destructive amongst young lambs, and is a notorious nest-robber. Newly-planted grain crops also suffer by the depredations of large flocks of these birds; and in the neighbourhood of Seven Hills and Blacktown it has (now twelve years ago) added oranges to its already extensive and varied diet.

140. Corvus coronoides, *Vigors and Horsfield.* Crow.

Corvus coronoides, North, Nests and Eggs, Austr. Bds., p. 186, pl. vii, fig. 8 (egg), 1889.

This bird differs only from the preceding species in its much smaller size, and in having the basal portions of the features, upper surface, pure white. It is, however, not so numerous or so destructive as *C. australis*, its food consisting chiefly of insects, small reptiles, berries, and seeds. Both species are known as "Crows."

141. Oriolus sagittatus, *Latham.* Green Oriole, "Green-backed Thrush," "Fruit Thrush."

Oriolus viridis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 13 (1848).

Mimeta viridis, North, Nests and Eggs, Austr. Bds., p. 183 (1889).

A common species in the coastal shrubs and mountain ranges of eastern New South Wales. Insects, berries, and fruits constitute the food of this species. It commits great havoc in orchards and vineyards.

142. Ptilonorhynchus violaceus, *Vieillot.* Satin Bower-bird.

Ptilonorhynchus violosericeus, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 10 (1848).

Ptilonorhynchus violaceus, North, Nests and Eggs, Austr. Bds., p. 175, pl. xi, fig. 6 (1889).

The same remarks applies equally to this species as the preceding one.

143. Chlamydodera maculata, *Gould.* Spotted Bower-bird, Pink-naped Bower-bird.

Chlamydodera maculata, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 8 (1848); North, Nests and Eggs, Austr. Bds., p. 178, pl. xi, fig. 5 (1889).

This species frequents chiefly the scrubby arid country of central and western New South Wales. It is equally destructive to fruits of all kinds, as is the Satin Bower-bird.

144. Sericulus melinus, *Latham.* Regent Bower-bird.

Sericulus chrysocephalus, Gould, Bds. of Austr., fol. ed., Vol. iv, pl. 12 (1848).

A species frequenting chiefly the northern coastal scrubs of the State, the adult male of which is distinguished by its richly contrasted golden-yellow and black plumage. It is common in the Tweed, Richmond, Clarence, and Bellinger Rivers districts, and occurs, but in limited numbers, as far south as the Hawkesbury River. Its usual food consists of insects, berries, and wild fruits, but it is also fond of cultivated fruits.

145. Sphecotheres maxillaris, *Latham.* Fig-bird, "Mulberry-bird," "Red-eye."

Sphecotheres australis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 15 (1848); North, Nests and Eggs, Austr. Bds., p. 185, pl. xi, fig. 77 (1889).

A species also frequenting the northern coastal scrubs of the State, but not occurring so far south as the Regent Bower-bird. Commits great havoc among the softer cultivated fruits, hence its vernacular names of "Fig-bird" and "Mulberry-bird."

146. Ptilotis lewinii, *Swainson.* Lewin's Honey-eater.

Ptilotis chrysotis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 32 (1848).

Ptilotis lewinii, North, Nests and Eggs, Austr. Bds., p. 199, pl. xiii, fig. 1 (1889).

Common in the coastal scrubs and mountain ranges of eastern New South Wales. Like all the members of the family *Meliphagidæ*, its food consists principally of insects and the pollen or nectar of flowers. It is also a fruit-eater.

147. Ptilotis chrysops, *Latham.* Yellow-faced Honey-eater, "Chickup."

Ptilotis chrysops, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 45 (1848); North, Nests and Eggs, Austr. Bds., p. 207 (1889).

Common all over New South Wales, and very destructive to most cultivated fruits, and is credited with eating bees.

148. Ptilotis fusca, *Gould.* Fuscous Honey-eater.

Ptilotis fusca, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 44 (1848); North, Nests and Eggs, Austr. Bds., p. 206 (1889).

Freely distributed over the State. It frequents orchards and vineyards, and sometimes eats grapes and cherries, but it is not so mischievous as the preceding species.

149. Myzantha garrula, *Latham.* Garrulous Honey-eater, "Soldier-bird"; Miner, "Yellow-beak."

Myzantha garrula, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 76 (1848); North, Nests and Eggs, Austr. Bds., p. 229, pl. xii, fig. 2 (1889).

A common and well-known species found over most parts of eastern and central New South Wales. It commits great ravages in orchards and vineyards.

150. Meliphaga phrygia, *Latham*. Warty-faced Honey-eater. Mock Regent-bird.

Zanthomyza phrygia, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 48 (1848).

Meliphaga phrygia, North, Nests and Eggs, Austr. Bds., p. 210, pl. xii, fig. 8.

Like many other members of the *Meliphagidæ*, the food of this species consists chiefly of insects and the nectar of flowers, but it is also very destructive to cultivated fruits, and has a decided weakness for figs and grapes. Gould has beautifully figured this showy and attractive species, but the position of the nest is misleading; it is always well concealed by the thick forked limb in which it is built.

151. Tropidorhynchus corniculatus, *Latham*. Friar-bird, "Leather-head."

Tropidorhynchus corniculatus, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 58 (1848); North, Nests and Eggs, Austr. Bds., p. 217) 1889).

Equally destructive to fruit of all kinds as the preceding species. Although the Leather-head is partially insectivorous, it is a perfect scourge in some seasons to viticulturists. Generally it is most destructive to the summer fruits.

152. Tropidorhynchus citreogularis, *Gould*. Yellow-throated Leather-head.

Tropidorhynchus citreogularis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 60 (1848).

Philemon citreogularis, North, Nests and Eggs, Austr. Bds., p. 219, pl. xii, fig. 3 (1889).

A smaller species than the preceding one, frequenting the inland districts of the State. The vernacular name is only applicable to the young and immature birds of this species.

153. Entomyza cyanotis, *Swainson*. Blue-faced Honey-eater.

Entomyza cyanotis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 68 (1848); North, Nests and Eggs, Austr. Bds., p. 223, pl. xii, fig. 1 (1889).

The Blue-faced Honey-eater is more freely distributed inland than near the coast. Its food consists of insects and nectar, obtained principally from the flowering Eucalypti; and to which diet is frequently added cultivated fruits of various kinds.

154. Plectorhynchus lanceolatus, *Gould*. Lanceolated Honey-eater.

Plectorhyncha lanceolata, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 47 (1848); North, Nests and Eggs, Austr. Bds., p. 209, pl. xiii, fig. 2 (1889).

This species is only found in the inland districts of the State. During the month of March small flocks of this species of Honey-eater commit great ravages in the vineyards in the neighbourhood of Wagga, piercing and destroying many grapes with their spine-like bills.

155. Anthochæra carunculata, *Latham*. Wattled Honey-eater, "Gill-bird," "Wattle-bird."

Anthochæra carunculata, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 55 (1848); North, Nests and Eggs, Austr. Bds., p. 215 (1889).

A common and well-known species frequenting the coastal districts near Sydney during the late autumn and early winter months, and breeding freely in spring in the Blue Mountains. In the gardens on the mountains it is very destructive in January and February in dry seasons, and does much damage among plums and apricots, and later on about Albury and Goulburn in the vineyards.

About thirty species of Honey-eaters are found in New South Wales, and many of them live entirely upon insects and the nectar or pollen of flowers. Doubtless there are other members of the family *Meliphagidæ* destructive to fruit, but only those most frequently met with in orchards or vineyards are enumerated here.

156. Zosterops dorsalis. *Latham* (*Z. westernensis*, Quoy et Gaimard). Grey-backed Zosterops, "Silver Eye," "White Eye."

Zosterops dorsalis, Gould, Bds. Austr., fol. ed., Vol. iv, pl. 81 (1848). (*Autumn and Winter plumage.*)

Dacnis westernensis, Quoy et Gaim. Voy de l'Astrol. i, p. 215, pl. 11, fig. 4 (1830). (*Spring and Summer plumage.*)

Zosterops cærulescens, North, Nests and Eggs, Austr. Bds., p. 233 (1889) id. Rec. Austr. Mus., Vol. ii, p. 98 (1896).

Zosterops westernensis, North, Nests and Eggs, Austr. Bds., p. 234 (1889).

The "Silver Eye," which varies so much in its summer and winter phases of plumage, is probably known to every orchardist and viticulturist in the State. Although partially insectivorous and ridding fruit trees and shrubs of many injurious insect-pests, it does an immense amount of damage to grapes and soft fruits.

157. Cacatua galerita, *Latham*. Sulphur-crested Cockatoo, White Cockatoo.

Cacatua galerita, Gould, Bds. Austr., fol. ed. Vol. v, pl. 1 (1848); North, Nests and Eggs, Austr. Bds., p. 250 (1889).

Most of the different species of the genus *Cacatua*, also the Parrakeets and the Lorikeets, inhabiting New South Wales are either destructive to grain or fruit, both in some instances; but only those most frequently met with, on farms and orchards, of the large Family *Psittacidæ* are referred to here. The present species, which is found in favourable situations all over the State, feeds upon seeds and suturous roots, and on the Native Bread or Truffle (*Mylitta australis*), which it digs up with its powerful bill. Immense flocks of these birds also do considerable damage both to newly-sown and standing grain-crops.

158. APROSMICTUS CYANOPYGIUS. *Vieillot.* King Lory. "King Parrot."

Aprosmictus scapulatus, Gould, Bds. Austr., fol. ed., Vol. v, pl. 17 (1848): North, Nests and Eggs, Austr. Bds., p. 255 (1889).

Common in the coastal districts and contiguous mountain ranges of the State. Very destructive to maize crops, and has been known to eat exposed portions of potatoes.

159. PLATYCERCUS EXIMIUS. *Shaw.* Rosehill Parrakeet. "Rosella."

Platycercus eximius, Gould. Bds. Austr., fol. ed., Vol. v, pl. 27 (1848): North. Nests and Eggs, Austr. Bds., p. 258 (1889).

The well-known Rosehill Parrakeet, or "Rosella," as it is more frequently called, is distributed in favourable situations over the greater portion of New South Wales; it is far more common in the coastal districts, and is not found in the dry western portions of the State. In addition to its grain-eating proclivities, it is very destructive to most kinds of soft cultivated fruits.

160. PLATYCERCUS ELEGANS, *Gmelin.* Pennant's Parrakeet. "Red Lory." "Lowry."

Platycercus pennantii, Gould. Bds. Austr., fol. ed., Vol. v, pl. 23 (1848): North, Nests and Eggs, Austr. Bds., p. 257 (1889).

An equally common species as the preceding, and frequenting the same situations. A notorious orchard marauder, and very destructive in grain crops, particularly when the young maize is just formed in the cobs.

161. TRICHOGLOSSUS CONCINNUS, *Shaw.* Musk Lorikeet. "Green Parrakeet." "Red-eared Parrakeet."

Trichoglossus concinnus, Gould. Bds. Austr., fol. ed., Vol. v, pl. 52 (1848).

Glossopsitta australis. North. Nests and Eggs. Austr. Bds., p. 268 (1889).

During the months of January to April inclusive, in some seasons, the Musk Lorikeet is the most destructive member of the Family *Psittacidæ* in orchards and vineyards of the coastal districts of the State. Countless numbers will devastate an entire fruit crop, and leave not a vestige of it to be seen. So tame are they when so engaged that repeated shooting does not frighten them, and they may be killed with a stick or taken by the hand. Associated with them, but in limited numbers, may also be seen Swainson's Lorikeet, the Scaly-breasted Lorikeet, and the Little Lorikeet. Fortunately these visitations are not of common occurrence, and they generally follow destructive bush-fires, which destroy the flowering *Eucalypti*, whose nectar form a great portion of its food. Stomach of these birds obtained while feeding among the gum blossoms, I have frequently noted, contained the remains of small black beetles.

(*Conclusion.*)

Brisbane Show Notes.

M. A. O'CALLAGHAN.

The Agricultural Exhibition held recently at Brisbane was remarkable for two things, viz. :—(1) Its varied, abundant, and excellent display of farm products under the heading of District and Interstate Exhibits. (2) Its excellent display of dairy cattle—more particularly of Ayrshires and Jerseys. If I might add a third feature of note, it would be the admirable manner in which the judging of the cattle and horses was facilitated by arrangements made almost perfect by the untiring and finished work of the ring stewards.

"Speculation of Whitehall" (imp.).

The cattle are judged on the first day in a part of the main ground or ring, there being few horses present, and no one save the stewards and those leading the cattle are within speaking distance of the judges. This is as it should be. The judging of the miscellaneous horses and hunters begins on the second day, and the horses might be said to hold the ring during the remaining days of the exhibition.

Harking back to the cattle! Most people spoke of the excellent display made by the Jerseys, but what impressed me most was the character and quality of the Ayrshire bulls. In the class for three and under four years there were three imported bulls which stood out for type and character, and they will no doubt prove of very great value to the State of Queensland. Two of these were placed first and third, being separated by a New South Wales bred bull of great substance.

The winner of the blue ribbon, who afterwards won the championship, fills the eye very well, has a typical head and horn, but is rather short in the neck and slightly coarse in the shoulder. He has great depth, and his ribs are well sprung. His colour and skin are excellent. I give his colour as brown and cream rather than brown and white. He is good behind, but not so good as the third prize animal, and though of good bone is a bit deficient in his hocks. His tail is well set on for an Ayrshire, and hangs well. He is an animal that, like Jamie of Oakbank, shows himself all the time as though proud of the figure he cuts. He was bred by Mr. H. Smith, Ochiltree, Scotland, is named "Speculation of Whitehall," and is owned by the Queensland Government, being stationed at Gatton Agricultural College.

Another Government institution owns the third prize bull "Ardgowan King Fritz" (imp.), by "Duke King of Ardgowan," from "Louise of Ardgowan," bred by Sir W. R. Shaw Stewart, Bart., Ardgowan, Scotland. This animal, though nearly as old as the champion, is still not so matured from the point of view of a sire. He is of the long reachy type that does not ripen so quickly as the thick cobby sort. His head, neck, and shoulders are well-nigh perfect, and he is undoubtedly better here than the champion. He is, however, not quite so good in the middle-piece nor so deep as the winner. He is very good behind, with a first-class escutcheon and well-placed false teats. His thigh and hindquarter are good, and when another year older, all going well, he will be a very hard bull to beat. He should get good milkers. He still carries his Scotch coat, which is rather longer and coarser than some like to see on dairy cattle. His skin is very good, and his colour is the popular red and white.

Mr. John H. Brown, Brisbane, also exhibited an imported bull in this class named "Wigton Boy," bred by Messrs. Lindsay, Carsegowan, Wigtown, Scotland. He is a bull of considerable quality, with an excellent head and neck, but lacking in substance. He does not appear to be acclimatised, and later on, if his constitution develops, I expect to see a very nice breedy animal.

In the two-year-old class Mr. J. McWhirter showed an imported bull of type and character, but evidently he has not yet become sufficiently acclimatised to do himself justice, as he lacked condition and polish. This bull is named "Forest Chief," and was bred by Mr. John Cochrane, Kilmarnock. His colour is white and dark-brown. He won in his class.

In the young bull classes the Government institutions above named owned nearly all the animals entered.

Jerseys.

This breed was well represented in all classes, and the champion male and female would do credit to any show-ring. Both are imported

"King Lear" (imp.).

"Grasfort Queen" (imp.).

animals. The bull, "King Lear," by "Helena's Fox" (3208 I.H.B.), from "Goneril" (7595 I.H.B.), is a typical Island Jersey of great quality

and type. His carriage could not well be better, and he looks what he is—a bull of very aristocratic lineage. He has "Flying Fox" for one of his grand sires, and away back the celebrated "Golden Lad" (1242). He was bred by Mr. C. Mourant, St. Saviour, Jersey. This bull is very good on top, has an excellent head perfectly set on, but is yet rather light in the middle-piece and lacking in that great depth which we wish to see in our dairy cattle, no matter what the breed. He is, however, young, and no doubt will fill out into a deeper-bodied animal.

The champion cow, owned by Mr. O'Shea, Brisbane, is the type our dairy-cattle breeders love. She is of the great depth and substance which goes with a vigorous constitution. She is a rich golden fawn, carrying all the polish of good health and grooming. She was bred by Mr. G. S. Le Gresley, St. Martin, Jersey, and is named "Grasfort Queen" (9455 I.H.B.). She has a typical head, but is somewhat baggy about the throat,

Group of Jerseys at Brisbane Show.
Imported by Mr. J. McWhirter.

and appears slightly heavy in front, but being in high condition this may disappear later.

The group of Jerseys, imported by Mr. McWhirter, seen in the illustration contains the champion Jersey bull and a first-prize cow and heifer. The heifer is a remarkably fine animal, and, all going well, should make a champion.

Guernseys.

Four Guernseys were shown in Brisbane, two of whom had only been recently imported, and two of whom had been bred by the New South Wales Department of Agriculture. Quality was well represented, but it is unfortunate that very fine sire The Apostle, by Peter (imp.), has lost his horns, because it destroys his chance of a show career.

New South Wales dairy farmers will see that our Queensland friends have taken up the question of breeding dairy cattle very seriously, and these recent importations should go far towards placing them in a position to successfully compete with the southern States in the future.

Queensland Nut.

Macadamia ternifolia, F. v. Müeller.

W. J. ALLEN.

In quite a number of the gardens in the coastal districts of the north eastern portion of the State may be found a few of these nut trees growing, particularly on the northern rivers, where the tree does remarkably well on

Fig. 1.—Queensland Nut (*Macadamia ternifolia*), F.v.M.

the deep rich soils and where there are no severe frosts to check its growth.

Baron von Müeller's description of it is as follows:—"The nut tree of sub-tropical Eastern Australia, attaining a height of 60 feet; hardy as far

south as Melbourne; in forest-valleys probably of fair celerity of growth; endures slight frost. In favourable localities it bears fruit in seven years. The nuts have the taste of hazels."

Fuller, on Nut Culture, gives the following description:—"Australian Hazelnut, the fruit of *Macadamia ternifolia (Proteaceæ)*. There are two species, both evergreen trees or tall shrubs confined to Eastern Australia The fruit is a kind of drupe with a fleshy exterior, enclosing a hard shell nut not unlike a small walnut. The kernel when mature, has a rich and agreeable flavour, much like, but richer than the hazelnut, hence one of its local names for it is also known as the 'Queensland Nut.'"

Fig. 2.—Queensland Nut, showing how the nuts hang.

At the Wollongbar Farm there are several trees growing and doing well, and producing some good nuts. Mr. G. L. Austin, of Rous Mill, within a few miles of the farm, has over an acre of these nuts, which are doing well with him, and which prove themselves very profitable, finding ready sale for them at from 6d. to 7d. per lb. The nuts retail in the Sydney fruit shops at 1s. per lb., and are very well liked when they become known. At present the supply in our own State cannot be anything like equal to the demand, and it seems to me that if these nuts were produced in quantities, we should be able to find a ready sale for large supplies in Great Britain and America. The tree is rather slow growing in habit, and does not produce many nuts

until after it has been planted from six to nine years, but after that it usually carries fair crops, increasing in quantity until the tree attains a good size.

Fig. I.—The tree shown is one growing in the garden of Mr. James Inglis, at Strathfield, and produces a good many nuts annually.

Fig. II.—Shows how the nuts hang. Sometimes only one or two are hanging on the one twig, and from that up to twenty-five nuts will be found.

Fig. III.—Shows the nut in different stages. Nut No. 1, with the husk before it begins to open; No. 2 is just beginning to open; No. 3 with the

Fig. 3.—Queensland Nut, showing different stages of growth.

husk off; No. 4 shows the shell broken in halves and disclosing both kernel and shell, which latter is very hard and difficult to break: No. 5 is a kernel with the shell removed. These are all natural size.

This is one of the best flavoured nuts on the market, and I would recommend all those who have not tasted them to buy a few and try them, and also to plant a few trees, or a number, if they are situated close to the coast and have good deep soil, which appears to suit them best.

A few Notes on Grasses.

C. H. GORMAN.

Kangaroo Grass (*Anthistiria ciliata*).

THIS is a grass that is well known all over the State as an excellent fattening grass, and may be considered among the best for the purpose. There are thousands of acres of it around the Casino district, where it

Kangaroo Grass.

grows to great advantage. There it is also used as a dairying fodder, but its value as a milk producer is not very great. It is hardy and strong in growth, a deep rooter, grows tussocky and erect. It grows luxuriantly from October or November, and makes hay of fair quality.

Guinea Grass (*Panicum maximum*).

This is certainly one of the most valuable grasses that can be grown for fodder purposes, and the wonder is that more serious attention is not directed towards it. Many reports have been made on the grass and its value, and it seems like pegging away for nothing to write on it again. The results are apparent, both from trials on this and private farms. Some years back Mr. McKeown, now Manager at Wagga Farm, cut

Guinea Grass.

19 tons 6 cwt. per acre. A glance at the illustration will show the great amount of succulent matter produced. Its cultivation is easy, and 1 or 2 acres of it for feeding in either green or preserved form will warrant all trouble and expense gone to. It is safe to say that it is quite out of the experimental stage now. Stock are very fond if it, and its greatest fault lies in the fact that it will not stand frost. As a summer grass, it is a wonderful grower, and makes excellent hay.

Natal Red Top (*Tricholæna rosea*).

This is an extremely useful grass in combination with other varieties of a heavier nature. Its habit of growth is upright, and it bears the virtue of being a quick spreader. In its young state it is most palatable to

Natal Red Top.

stock, and can be converted into hay with good results. It is looked upon as a good grass for young stock, and grows luxuriantly in this district.

Rhodes Grass (*Chloris virgata*).

So much has been written about this grass that it should be well known to all interested in the introduction and propagation of useful varieties. It was introduced from South Africa, and given trials by a number of graziers and others, Mr. Sylvester Browne being the first to bring it prominently forward. Trials have been carried on at this farm for two years now, from a very small quantity of seed sent to the Director

Rhodes Grass.

of Agriculture by Colonel Kenneth Mackay, who brought it from South Africa. From the outset it grew well, and larger areas have now been set out, with every prospect of success. I have always considered it a good grass, and worthy of trial by those interested. The introduction of new grasses is sometimes the cause of much discussion of a con-

ANTHISTIRIA CILIATA, LINN.

troversial nature, and I have heard many say that "Rhodes" grass is no good. My opinion is that it will be found of great value, and I think it a little early to condemn the grass just because it has not shown itself as luxuriant a grower as, for instance, *Paspalum dilatatum*. When the latter was introduced, it was condemned too early by some, but it has proved itself beyond doubt. "Rhodes" grass is about in the same position as *Paspalum dilatatum* as regards frost resistance. It will stand a fair amount, but is cut down by a severe frost. There is no indication, however, of it being killed outright—merely a burning off, as in the case of other grasses.

REFERENCE TO PLATE.

A, Cluster of spikelets; B, Barren and fertile spikelets; C, The fertile terminal spikelet opened out to show the three glumes and awn; D, Grain, back and front views. All variously magnified.

(*To be continued.*)

Bird-lime for Sparrows.

The bird-lime may be spread on twigs placed near food or water. In the latter case, it is all the more likely to succeed where water is scarce.

We have tried it here (Hawkesbury Agricultural College), and the sparrows are just as cunning in keeping clear as is the case with poisoned grain.

If a decoy sparrow can be placed near by there will be more chance of success.

It has also been found that narrow strips of paper smeared with this substance, if placed where they can touch one, will prevent them getting away. The paper should be dark and strong.

If such a plan is tried, the trap should be placed in as natural a way as possible so as not to frighten the bird.

One trouble is, that it is necessary for someone to be near at hand to take the birds if they are caught, as they are strong and quite likely to break away from the retaining twigs if they are allowed any time to struggle about.

Any chemist can obtain the substance wholesale. It is about 3s. per lb.

C. T. Musson.

The Farmer's Garden and its Enemies.

WALTER W. FROGGATT, F.L.S.,
Government Entomologist.

It is a very poor farmer who has not a plot of ground somewhere about the place that he calls his garden, but while one often finds one worthy of the name of garden, properly fenced, well kept, well tilled, without weeds or rubbish cumbering the beds and paths, and everything flourishing, how often do we come across the reverse. A few decrepit rails and slack wires are the only protection against the pigs and poultry; the family calf may be tethered in the middle of it, the beds full of cabbage stalks covered with shoots infested with aphis, with decayed full-grown plants left over from last cutting, a home for all kinds of garden pests, ready to pounce upon the young plants that later on will be planted out beside them. The tomato beds are much the same, the old plants broken down and frost-bitten, with fruit in all stages of decay hanging to their withered stalks or littering the ground beneath.

It is remarkable how little attention is paid to "garden truck" as the Americans call it, though such an important factor in the food supply of the homestead. Even in districts like Campbelltown it is quite a common sight to see the Chinaman with his vegetable cart calling at the orchardist's house, where there is unlimited ground fit to supply all his wants. How many farmers are growing their own potatoes at the present time, and what does it cost them to buy them? Now, without going into the matter of gardens that abound in plague spots or otherwise, there are always a certain number of pests of many different kinds to contend with, and in this paper I propose to group them together and give a simple account of each and how best to check or get rid of them.

Many fungus diseases also abound in gardens and require different treatment; powdery mildews that wrinkles up the leaves and causes the flower-buds to become aborted and drop off, can be best checked by dusting with sulphur, and the kitchen flour dredger is one of the best implements to use for this work. Other spots and moulds on the leaves and stems can be usually kept under by using a solution of bluestone in a garden syringe. If all dead leaves about the plants are cleared away, great numbers of the tiny spores are destroyed, which otherwise multiply in countless millions, float about in the air, fall upon any scar or wound on the healthy plants, infect them, and carry disease all over the place. The natural tendency of all old leaves and stalks of a plant is to decay, and when this commences, spores and germs of all kinds are liberated, therefore if all such matter is removed the garden crops have a much better chance of doing well.

FARMERS' GARDEN PESTS.

1. *Caterpillar—Side View enlarged.*
2. ,, *Natural Size.*
3. *Moth—* ,,
4. ,, *Enlarged.*
5. *Pupa—Natural Size.*
6. *Pupa—Enlarged.*
7. *Potato, with Cocoons attached.*
8. *The Potato-leaf Ladybird.*
9. *The Twenty-eight Spot Ladybird.*
10. *Garden Slug.*
11. *Garden Snail.*

Snails and Slugs.

Old gardens in particular are often so overrun with these introduced pests that it is difficult to rear any small plants or seedlings; and the simple way in which they can be carried about in packing or plants makes them world wide in their distribution.

After a spell of long-continued dry weather, let us get a wet night and out swarm these creatures from crevices and corners in which they have been sheltering. This is the time to go out with a tin of salt and water, and gather them in; and in a small plot, if this method is followed up, it is wonderful how quickly you can reduce their numbers. A second method, most effective with the naked black slugs, is to rub dripping over the underside of well-grown cabbage leaves, and lay them about among the plants. This bait seems to have a great attraction for all kinds of slugs, and they gather together from all sides to feast on the grease, when they can be collected and destroyed. As a protection against snails, however, there is nothing like tobacco dust. A little ring of waste tobacco dust will protect the most delicate seedling; for as soon as a snail or slug crawls on to the tobacco, it simply turns over, with its foot slimy and frothy, and is incapable of motion, dying a victim to tobacco poisoning.

Millipedes (False Wire-worms).

These are not true insects, as they consist of a small head, with a worm-like body of many joints or segments, each furnished with a pair of fine legs, which, when they crawl over a smooth surface, move with an undulating motion. They are, when immature, dull white; many species grow to 1½ to 2 inches in length; they frequent damp, sheltered places.

In England they are known as "False Wire-worms," and at times do a great deal of damage by devouring germinating seeds, and also by eating the soft, juicy parts of turnips, carrots, and such like vegetable matter. This season they have, in consequence of the wet season in the country, turned up in both gardens and lucerne paddocks, in the latter attacking the young plants. To keep these pests from the seedlings, bits of potatoes are placed about among the rows.

The Pumpkin Beetle (Aulacophora hilaris).

This is one of the worst leaf-eating beetles that the gardener has to deal with, as they often appear in such numbers that they simply cover the leaves and flowers, and, if undisturbed, will soon destroy all the pumpkin and cucumber plants in the place, even after they are well grown.

It is a small, orange-yellow beetle, with the body marked with two rows of black spots; and though often called a "ladybird," is a very different insect to the true ladybird beetles, which are more rounded in form, without any neck-like thorax between the head and body. It is simply a case of mistaken identity, on account of a similarity of colour.

Though this beetle has been well-known for a great number of years, we know nothing about its earlier stages of life, though most of the plant-eating

beetles usually have larvæ with the same habits. If the pumpkin plants are well dusted with lime all over the flowers and foliage, the beetles will leave them at once.

Plant-eating Ladybird Beetles (Epilachna 28 punctata.)

This beetle belongs to a small group of the ladybirds which are remarkable for feeding upon the foliage of plants, unlike all the other members of the family that devour aphis scale and other minute pests.

Epilachna 28 punctata.

This beetle might at first sight be easily mistaken for our black spotted ladybird (*Leis conformis*) a great enemy to aphis and scale insects, but the shoulders are more curved in behind the head, the yellow ground colour has a dull brownish tint, and the black markings not in such regular rows, so that it has five rows instead of four. The larvæ are very different looking dull yellow-coloured creatures, clothed with rows of branched black spines, are gregarious in their habits, and when pupating cluster together on the under-surface of the leaves. This beetle infests various kinds of solaniums in its native state, and when it appears in gardens attacks the foliage of potatoes and tomatoes.

Epilachna guttato-pustulata.

The second species, which is more confined to the northern part of the State (*Epilachna guttato-pustulata*) is a much handsomer beetle, about the same size and shape, reddish-brown, with black markings on thorax and wing covers, dull-red blotches in the centre, and the sides blotched with lighter yellow. It has the same habits, and in southern Queensland is a common insect in the bush and gardens. They are easily driven away in the beetle state by dusting the plants with lime.

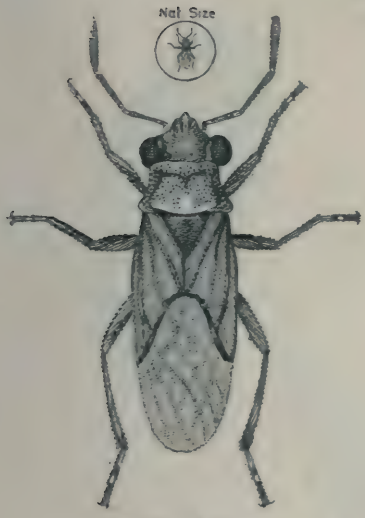
The Rutherglen Bug (Nysius vinitor).

This little plant-bug is a light-brown insect with silvery-grey wings, measuring about one-sixth of an inch in length. They fly very well, and in the warmer part of the day are very active, while during the night and morning they cluster among the foliage sucking up the sap with their sharp beaks, and soon causing the plants to shrivel up and die. They are particularly fond of tomato and potato plants, though they infest many other plants and trees. They appear in the summer from the eggs that have been deposited on the grass stalks and weeds by the last brood. It is very little use spraying the plants to kill the bugs, as they always shelter under the foliage, or fly at the least alarm. The best method to rid the plants is to take a shallow dish or tray containing a mixture of water and kerosene in the early morning, and

drawing it down along the plants, beat the foliage over with an old broom or cloth, when the insects will fall and be smothered very easily. A simple sheet can be drawn along in the same way, and the bugs gathered up and destroyed.

4

Nysius vinitor.



Nysius vinitor.

5

Head of Nysius vinitor.

The Common Cut-worm (Heliothis armigera).

Though quite a number of different moth-grubs are known under the popular name of "cut-worms," it is the larvæ of the American boll-worm, now world-wide in its distribution, that is the chief offender. A cotton pest in America, a trouble to maize-growers on the Northern rivers, it is common among our tomatoes, and gets into the pea-pods, devouring the enclosed seeds; while in the open it gnaws off the freshly set out plants, and after eating its fill, buries itself in the soil beneath the scene of its depredations, when it can be easily uncovered and destroyed.

It is of the usual naked cylindrical form, varying from a dirty olive-green tint to pale green, showing a regular pattern on the sides and back. The moth, one of the thick-set night-flying noctuids, laying her eggs among the rubbish or on the plants. The larvæ, when hatched out from the eggs, feed upon the surrounding vegetation, and are not particularly noticeable until fully half-grown. In the daytime they hide under the plants or half-buried

in the soil, so that one of the best ways of collecting them together and destroying them is to pile up a little heap of weeds or leaves on the edge of the path or among the plants under which they will creep for shelter. Poisoning bran or pollard with Paris Green, and spreading it about in teaspoonful's among the infested plants will soon kill them off, as all cut-worms readily eat bran and pollard. It is best mixed with a little water, and each bait half-buried in the surface soil. I have always found it very effective among tomato plants.

The Bean and Potato Looper (Plusia verticillata).

The slender green caterpillar, though the moth is a distinctive noctuid moth, has the form and habits of the looper moth caterpillars ; the legs upon the body segments being placed far back near the tip, so that when crawling along the hind portion is drawn up close behind the head, and the central

Plusia verticillata. (1) Adult Moth. (2) Pupa. (3) Larva. (4) Cocoon.

segments form a rounded loop, before the front legs are raised and advanced. The eggs are deposited by the dull-brown moth—which can be recognised by the silvery markings on the fore wings—upon the foliage, and the delicate green tints of the caterpillar harmonise so exactly with the colour of the leaf, that they are not at all noticeable until they begin to gnaw holes in the leaves. This might be described as the commonest pest upon French beans ; but it also does a great deal of damage to potatoes at times, and was quite a plague on the latter in the Windsor district some years ago. Experiments carried out during that outbreak proved that arsenical sprays did not seem to have much effect on these grubs, probably because it is always difficult to spray the under surface of field crops. Brushing the plant lightly over a sheet or dish caused the grubs to fall in great numbers, when they were easily destroyed, and the pest was kept under.

The Potato Moth (Lita solanella).

Though potatoes can be better looked after in the garden than when they are planted in the fields, this little silvery-brown moth is so widely distributed over the country that it is always on the lookout to deposit its eggs upon these tubers, and is always worst in hot dry years.

Though the moth deposits her eggs upon the foliage of the potato, upon which the first brood of caterpillars feed, it is not until the potatoes are dug up that the second brood of moths have any chance of infesting them. They are safe underground; but as soon as they are dug the moths lay their eggs upon the tubers and the grubs that hatch out soon burrow their way under the skin and soon destroy it;—if they are allowed to lie about in the garden or exposed in open bags they soon show signs of the grub, so that the sooner they are covered up the better. The careful farmer pits his potatoes, or covers them, placed in boxes, with dry sand or ashes, and burns up all the potato tops and rubbish in the garden. A little care will keep the garden potatoes clear of "fly" or moth.

The Diamond-backed Cabbage Moth (Plutella cruciferarum).

If a person takes the precaution to dip all the young cabbage-plants into a bath of weak kerosene-emulsion, or tobacco-wash, before he sets them out, (having buried or otherwise destroyed all the waste and refuse after the cabbages were marketed), unless he happened to be close to a neglectful neighbour's garden, he would have very little trouble with the cabbage moth.

When, however, this moth once gets into the garden plot, it takes a lot of work to clear them out. Many remedies are effective when applied in the earlier stages of the plants' growth—such as spraying with weak kerosene-emulsion, or tobacco-wash; but the nearer the plants reach maturity the more difficult they are to treat, both on account of size and the danger of tainting them with the mixtures used.

The little brown moth is easily distinguished from others by the row of lighter-coloured angular or diamond-shaped marks along the back, when it rests with its wings folded up. It is seldom seen unless the plants are disturbed, but the slender pale-green caterpillars gnawing holes in the leaves and later on the curious net-like cocoon containing the pupæ are very readily detected.

The Cabbage Aphis (Aphis brassica).

When the spring is dry and very little sap is coursing through the veins of the young plants, these aphis generally do the most damage to cauliflower and cabbage, which cannot withstand their attacks under such conditions, and become stunted, wilted, and spoiled.

Later on in the summer in a good season immense swarms of aphis sometimes cover the outer leaves of the plants. This autumn large consignments of cauliflowers crossed the border at Albury from Victorian growers, which, when transhipped into our trucks were simply gray with aphis which, shaken up on the journey, could be shovelled up from the bottom of the empty

truck. I obtained a number of leaves and found nearly every aphid remaining attached to them was simply a shell containing a little wasp parasite (probably the common little braconid *Aphidius rapæ*). As the bulk of the free aphids were more or less damaged before they reached Sydney we probably received as many parasites as aphis.

The wingless cabbage aphis (the form that does the chief damage) is a small greenish-blue insect, covered with a gray mealy coating, which assists it to throw off any fluid mixture that may be applied. It has been found that where a good pressure of water with a hose can be used, or even a fine-rosed watering-can, it will help to clean the plants as well as anything, but tobacco and soap wash can be used with good effect in small areas.

Eupatorium rebaudianum, Bertoni.—A Reputed Sugar-producing Plant from Paraguay.

A few months ago paragraphs went the round of the Australian Press drawing attention to the above plant (called in some accounts *E. repandum*, Willd., a different plant). Inquiries were made at the Botanic Gardens for the plant, and as I had not got it I applied to Kew. I have just had reply that it does not even exist in the Kew Herbarium, but the Director of Kew draws my attention to the account of the plant in the *Kew Bulletin* for 1901, p. 173, from which the following interesting particulars are taken :—

Caá-êhê or *azucá-caá*.—Early in the present year, Mr. Cecil Gosling, H.B.M. Consul at Asuncion, Paraguay, sent to Kew a fragmentary specimen of a composite plant, with the following information :—

"I beg to enclose herewith some leaves of a plant which has lately been discovered in Pafaguay, by Dr. Bertoni, an Italian botanist, and Director of the Agricultural College here. This plant, which has probably been known to the Indians since a hundred years or more, and whose secret has, as usual, been so faithfully guarded by them, grows in the Highlands of Amambai, and near the source of the river Monday, not being, it is said, found further south than this. It is a modest shrub, growing side by side with the weeds and luxuriant grasses of that district, and only attains a height of a few inches. The leaves are small, and the flowers still more diminutive, and the Indians call it *Caá-êhê*, meaning, sweet herb, because of its sweetness, a few leaves being sufficient to sweeten a strong cup of tea or coffee, giving also a pleasant aromatic flavour. Its discoverer does not, however, believe that the *Caá-êhê* bears any relation to the saccharine properties of sugar, and he has named it after Professor Ovidio Rebaudi, of Asuncion, *Eupatorium rebaudianum*.

In an article describing the plant, Dr. Bertoni remarks, I think with great justice, to what extent we are indebted to those close observers of nature, the Indians, from whom we have learnt the use of tobacco, cocoa, maize, mani, manioc, potatoes, cotton, quinine, vanilla, rubber, and sarsaparilla. Truly a long list of benefits to mankind ! I am told also that Dr. Bertoni has lately discovered a tree, whose sap is alcoholic, and similar in taste and colour to a rough red wine, being used as such by the Indians."

Subsequently Mr. Gosling sent a copy of the *Revista de Agronomiá*, ii., pp. 35-37 (1899), where the description is given. There is no doubt that the plant possesses very strongly the power of stimulating the sensation of sweetness, for the smallest piece of a leaf causes a persistent sweetness in the mouth. We have not succeeded in identifying the fragments sent with any plant in the Kew Herbarium, but from the floral structure it belongs to *Stevia*, rather than *Eupatorium*, and its affinity is with *S. collina*, Gard.

J. H. MAIDEN.

Treatment of Snake-bite.

J. ASHBURTON THOMPSON, M.D.,
Chief Medical Officer, President Department of Public Health.

THE following directions for the immediate treatment of persons suffering from Snake-bite are published for general information.

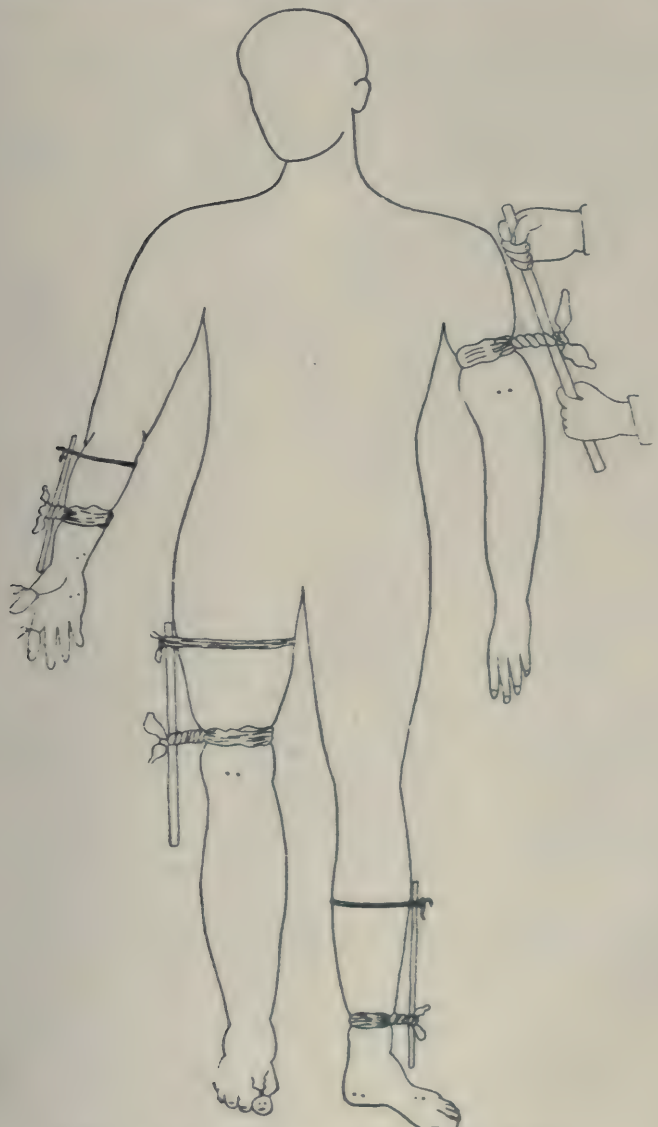


Fig. 1. Diagram showing method of applying ligatures.

Directions.

A Ligature—that is, a strong string, tape, narrow strip of clothing, or handkerchief—should be tied at once round the limb *above* the bitten part. When it has been tied, pass a piece of stick under it, and twist it round and round so as to screw up the ligature as tightly as you can. Leave the stick in the twisted ligature, and secure the end by another string as shown in the Figure (1). Great pain and swelling are caused by this, but cannot be avoided.

At the end of half an hour undo the ligature for five minutes; then tie and screw up again. At the end of another half-hour the ligature may be removed altogether.

In places where a ligature cannot be tied, as on the neck or face, pinch up the bitten part between the finger and thumb, and cut it out (Figure 2).

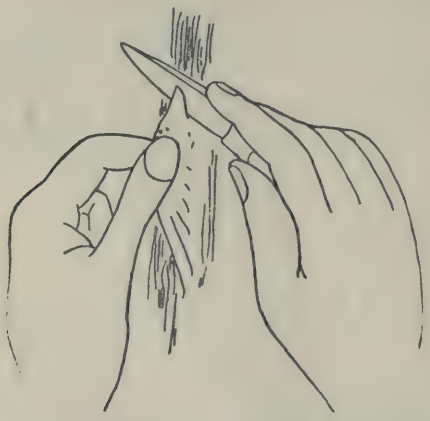


Fig. 2. Diagram showing method of cutting out bitten part.

In any case the bitten part should be cut into by numerous little cuts over and around the bites, for about half an inch around, and sucked by the mouth freely and perseveringly; and this can be done without danger by any person.

Stimulants, such as brandy, whisky, gin, rum, in small quantities at a time (a few teaspoonfuls), or strong tea or coffee, or wine, may be given if the patient be faint.

Do no more to the patient than is advised above, but obtain the services of a medical man.

Orchard Notes.

W. J. ALLEN.

October.

Owing to the dry weather prevailing during the last few months the crops of black tares, grey field-peas, &c., &c., have not made as much growth throughout the Cumberland orchards as they did last year, and if we do not get good falls of rain within the next six weeks the growers may find that the soil has become hard to plough when such crops are in condition for turning under. It is well not to leave them too late before turning them under. At our Wagga orchard, where the crop has been exceedingly heavy this year, most of it will be turned under by the first of October—at least all the most forward portion. At this orchard we dug up and weighed the tares from a plot of a yard square and it went at the rate of 16 tons 15 cwt. to the acre, when green, a fortnight before it was turned under.

The high winds which prevailed during a great part of September were responsible for blowing a good many oranges from the trees, which meant a considerable loss to growers, as owing to the dry, cool weather the fruit was hanging well in most districts—the winds, however, and the frosts have caused a great number of wind-falls.

Growers should see that the orchards are cleaned up as early as possible and the soil worked up to a good depth and cleared of all weeds, so that any moisture in the soil may be conserved for the sole use of the trees and fruit.

As soon as the petals have fallen spray the trees with arsenite of soda, directions for mixing which may be found on page 793 of the August *Gazette*, and are as follows :—*Stock solution*—1 lb. of best arsenic and 2 lb. washing soda boiled in 1 gallon of water for about three-quarters of an hour, or until the mixture is quite clear. Then add 1 pint of this stock solution to 40 gallons of water, to which has already been added from 6 to 8 lb. of best freshly-slaked lime. If this latter precaution is neglected the result will be serious damage to the foliage. Some varieties of apples are much more tender than others. For these use the larger quantity of lime. The arsenic is much cheaper than Paris green, and when bought in quantities should not cost more than about one-third as much per lb. For this State I am of opinion that at least four sprayings will be necessary to keep the moth in check.

If it is desired to add bluestone to the arsenite of soda solution, 3 lb. of bluestone may be dissolved in 1 gallon of hot water, and when thoroughly dissolved can be made up to 20 gallons by the addition of more water. Now take 1 pint of the stock solution of arsenite of soda and dilute in 20 gallons of water, in which from 6 to 8 lb. of freshly-slaked lime has been added, and pour this into the bluestone mixture, thus making the whole up to 40 gallons. Strain before using.

In spraying use as fine a nozzle as possible, the object being to cover the tree with as fine a mist as possible without any of the solution running off.

It will be well to get the bandages on the trees towards the latter part of the month, and these should be removed and examined every ten days after the grubs have made their appearance, and all grubs and chrysalids destroyed by cutting them in halves with a sharp knife carried for the purpose.

Keep a strict watch on all refills, and if these show any signs of wilting give them one or two buckets of water from time to time until they get a good start.

Disbud all newly-planted trees, leaving good shoots at least 4 inches apart along the trunk of the tree, and do not allow two or three shoots to start from the same place, as so many have done, but give each branch a separate hold of the main stem.

If the sap is well up, citrus-trees may be successfully budded this month. Keep all dormant buds and grafts well disbudded, so that the bud may get away good and strong. No suckers or shoots should be allowed to grow below the buds. It is also very essential that stocks should be cut back properly. The cut should be slanting, being slightly lower on the side opposite to the bud, and it is advisable to stake them, not only to prevent their being blown out, but to encourage a straight trunk.

Where grafts have been put in old trees they are even more liable to be blown off than small ones, and must be tied to prevent it. To do this a good stake should be tied to the branch grafted and allowed to project a foot or more over the end—then, as the graft grows, it can be tied to it.

While working around trees watch for borers on the trunks and branches, as when they are starting their work it is very easy to cut away the bark and find them, in this way keeping the orchard free of this pest.

As soon as the vines begin to grow sulphur them at least once before blooming for mildew, and twice if the weather is very damp. In coastal districts it is well to spray them immediately after the fruit is set with Bordeaux mixture, and, should caterpillars of any kind be eating the leaves, add Paris green to the solution in the proportion of 1 oz. to 20 gallons. Repeat the sulphuring from time to time, giving as many as eight applications if the season is at all damp. This will pretty well keep the oïdium in check.

Keep all vines well disbudded. I have noticed in many small vineyards that this important work is neglected. Never allow any branch to grow below the crown of the vine. To do the work properly it will be necessary to disbud all vines from two to three times.

Price of Kainit.

In a paragraph (August *Gazette*) referring to white ants attacking fruit-trees, vines, roses, &c., Kainit is recommended by Mr. Froggatt, Government Entomologist, but the price therein mentioned is wrong; a recent price-list gives the price of Kainit as 9s. per 2-cwt. sack.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of October.

Vegetables.

At this time of year, unless very dry weather prevails, vegetables should be abundant, and the prospects for the future should be good, until the intense heat of midsummer may check their growth; but even during the hottest weather, if good preparation be made now, there should be some kind of vegetables in abundance.

So far, and up to time of writing, everything is favourable for vegetable production in most of the western districts; but along the seaboard and for some distance inland extraordinary dry weather prevails, necessitating a good deal of trouble in watering, cultivating, and mulching to keep things going. (Rain has since fallen on the coast.)

A manure that is generally allowed to go to waste is soot. This is of considerable value in the vegetable garden, not only as a manure, but as an insecticide, or rather, perhaps, a preventive of attacks of insects. It is supposed to be of use only as a manure, in consequence of the nitrogen it contains, as that is the substance for which it is mostly recommended; but I feel sure that it is of value otherwise. At anyrate, soot should never be wasted, and every ounce, even, that can be scraped together should be made use of for vegetables. Asparagus and onions are much invigorated by an application or two. For these vegetables, it is generally mixed with some salt as a surface dressing.

If water be applied to the surface of the soil, always cultivate well after an application, as soon as dry enough, or else the soil may become hard and caked, and in a condition unfavourable for the growth of vegetables.

Beans, French or Kidney.—Keep up a succession of this kind of bean, which is one of the best of vegetables for summer use. If well grown, and the beans are gathered whilst they are young and tender, the plants will continue to produce beans for a considerable period. Sow from time to time various kinds of these beans, some dwarfs, some tall, one or two kinds of butter beans, scarlet runners, snake beans, and any varieties that are obtainable, and try a few experiments as to productiveness, flavour, endurance, and so on. By this means the best and most suitable variety for locality can be determined, and for the future this can be grown chiefly. But continue to try new varieties, for experimental work of this kind is useful as well as interesting, and tends to break the monotony of ordinary gardening work.

Lima Beans.—These useful beans, either tall-growing and dwarf, should always find a place in the vegetable garden. A few plants are likely to suffice, and these should produce beans for a considerable time. The tall-growing varieties are the most prolific, and are to be preferred.

Beet, Red.—Sow a little seed in drills, about 18 inches apart. If the seed be spread out on damp cloth or bagging, and covered over and kept warm, it will soon swell and germinate. It can then be sown, but the precaution must be taken to water the ground well, so that it becomes thoroughly saturated, after the seed is sown, otherwise the chances are that it wil die—that is, if the soil is dry. Beet-seed sown in the usual manner and unsprouted, takes a long time to germinate and come up, and much time can be saved if the above simple practice is followed. When the young beets have grown to the height of an inch or two, thin them out, for very frequently two or more plants will come up quite close together, and unless separated the results will be unsatisfactory. The globe varieties are the best to grow.

Beet, Silver.—A few plants of this excellent vegetable will probably be sufficient for a family. Seed may be sown in a seed-bed, and when the plants are well grown they can be planted out in a bed which has been heavily manured and well worked.

Cabbage.—Keep up a stock of cabbage as long as possible during the year, for it seems to be appreciated more than any other vegetable except the potato. Try a few varieties, for some kinds may do better than others in various localities. Small cabbages are sometimes much to be preferred to those that grow to an enormous size, although sometimes the latter will be found excellent. One of the best of these is Phenomenal, the seed of which is somewhat difficult to obtain. However, try a few experiments with varieties. Use abundance of manure for the cabbage, and supplement farmyard manure with bone-meal or superphosphates of lime, or apply a good dressing of lime to the soil a little time before digging in the farmyard manure. Spread the lime over the surface of the ground and rake it in. That will be quite sufficient, for lime has a tendency to sink with the soil. This should be remembered when making use of lime for agricultural as well as for gardening purposes. Mr. Krempin, of Newcastle, gave me some seeds of a new cabbage named "Extra Improved Early Summer Cabbage," and I sent it to the Howlong Viticulture Nursery for Mr. Ellis to try. It turned out to be an excellent one, and Mr. Ellis informed me that it is the best cabbage he ever grew, even better than Phenomenal. He describes it as rather low growing and broad, and its texture and flavour to be everything that could be desired.

Cauliflower.—This is not likely to succeed very well in hot, dry districts at this time of the year; but in cool, humid localities a few seeds should be sown and some young cauliflowers planted out.

Carrot.—Always have a few carrots ready for use, if possible, for the carrot is a good useful vegetable, and an excellent one for flavouring made dishes, for soups, &c., and for these purposes the carrots can be

used quite young and small. Land that had been well manured for some other vegetable would be the best to take for the carrot, for fresh manure is liable to cause irregular-shaped roots.

Celery.—This is a very useful vegetable for the summer, and one which is worth taking some little trouble to grow. A few seeds may be sown now to keep up a supply of plants. Seedlings already raised should be pricked out 3 or 4 inches apart, in rich soil, and when these have grown into good plants, they should be set out in a shallow trench which has been heavily manured. During summer celery is liable to "bolt," or run to seed, and when it does so, it may be pulled up as useless. To avoid this as much as possible, keep it growing from start to finish without the slightest check. Remove the seedlings carefully without disturbing their roots more than can be possibly avoided, watering them well before removal and after they are planted. Then never let them suffer the want of water, making use occasionally of liquid manure.

When the celery is about full grown, its leaf-stalks must be blanched, otherwise it will be unfit to eat uncooked. For this object, use may be made of soil, or any material that will keep out the light absolutely. Old bagging, boards, drain-pipes, pea and bean haulm are sometimes used, and effectively. Try the self-blanching kinds, which lend themselves readily to the blanching process. Indeed, these are sometimes planted in beds very close together, and then, when they grow dense, need but little, if any, assistance.

Celeriac, or Turnip-rooted Celery.—This is a kind of celery grown for cooking purposes, for which it is very useful. Sow seed, and transplant well grown seedlings—not to shallow trenches, but on the flat, about 18 inches apart. Keep the plants going by use of abundance of water, and cultivate them well and frequently, not earthing-up the bulging root or stem.

Cucumber.—Seed can be sown anywhere during the month. In the low warm districts plants should be advancing rapidly. To prevent the growth of long shoots, pinch the ends occasionally of main runners to induce the growth of laterals, and this will keep the plants compact.

Cress and Mustard.—Sow seed to keep up a supply. These two salads will need a good deal of watering during dry weather, and to induce speedy growth apply liquid manure once, or even twice, a week, but do not make it over-strong.

Capsicum or Chili.—This is sometimes known as "Pepper." Seed may be sown anywhere, but it is in the warmest districts that the plant will thrive the best. There are numerous varieties, and some of them are very ornamental, and worth growing in the flower garden for that purpose alone. For cooking purposes a very few plants should suffice. The smallest variety is the hottest and most pungent in flavour.

Egg Plant.—Sow seeds or plant out from seed-bed. This plant, or rather its fruit, is but seldom used as a vegetable in Australia. In

European countries it is made use of extensively. It is worth growing for ornamental purposes, for some of the egg-fruits—white, purple, spotted, and bright red—are very handsome when ripe.

Leek.—This useful vegetable requires a deal of manure and moisture during its growth. Seed may be sown, and any young leeks which are ready may be planted out in shallow trenches like celery. When planting, set the leeks rather deep in the soil, and when they are well grown earth up their stems to blanch them.

Lettuce.—This salad plant, the most useful of all, requires good treatment and attention during the summer months. It is very liable to run to seed if checked during its growth in any way. Sow seed for succession, and plant out a few lettuces from the seed-bed, taking great care not to break more roots than can be avoided. Use abundance of manure, and apply liquid manure, and water freely during dry weather.

Melon, Rock and Water.—Sow seeds freely anywhere. Attend to growing plants, pinch the leading runners occasionally, and keep the plants compact.

Okra or Gumbo.—Useful for its seed-pods, which contain a mucilaginous substance valuable for thickening soups, stews, &c. The plant bears a handsome flower and makes a fine ornament in the flower garden, but the flowers have a peculiar sickly perfume, objectionable to some tastes.

Seed may be sown, or seedlings which have been raised can be planted out.

Onion.—Seedlings which are well above ground must be looked after, cultivated, and weeded carefully. A few more seeds may be sown if more onions are required, during the month.

Parsnip.—Sow a little seed from time to time.

Peas.—Plants should be in full bearing all through the State. Seed may be sown to keep up a succession as long as possible.

Potato.—Plant out a row or two and cultivate well all potatoes which are above ground. Allow one shoot only to grow.

Pumpkin.—Sow seeds freely, and keep the vines bushy as they grow. This is one of the most useful of vegetables, and should always be grown. Sow the best seed obtainable. The old ironbark variety is about the very best to sow if seed can be obtained true to name.

Radish.—Sow a little seed occasionally to keep up a supply.

Rosella.—Valuable in the North Coast districts for preserve. The calyx of the flowers are used for this purpose. The plant is a species of Hibiscus, which succeeds only in very warm moist localities. Seeds may be sown now or seedlings planted out.

Rhubarb.—Those gardeners who desire to raise their own plants should sow a little seed during the month.

Sweet Potato.—A useful summer vegetable, which can be grown over a much wider range of country than is generally supposed. Tubers should be grown for the purpose of providing cuttings. These cuttings can easily be rooted in sand or sandy loam, or in almost any kind of soil,

even stiff, if made free and light with well-rotted manure. As soon as these cuttings are well rooted they are ready for planting out in a bed. The best kind of soil for this vegetable is sandy loam, or they can be grown in almost pure sand if well manured with rotted dung.

Tomato.—Sow seed and plant out strong young tomatoes already raised. These will still need protection at night in all cold districts. In warm early localities tomatoes are fruiting, and in some places already ripening their fruit.

Turnip.—Sow a litle seed in order to keep up a supply.

Vegetable Marrow, Squash, Bush Marrow.—Sow seeds anywhere, and attend to as advised for cucumbers, pumpkins, and melons.

Flowers.

October is one of our best months of the year for flowers, and the most popular of all—the rose—should be in its glory, especially if the season should prove rather moist. The hybrid perpetuals come to perfection about this time, and no kinds of roses can approach these for brilliancy of colour, for texture of petal, or for size. The teas, hybrid teas, and many other varieties and species are beautiful and particularly useful, being almost constantly in bloom, having generally delicious fragrance and graceful habit, but for robustness and grandeur the hybrid perpetuals excel. But with some few exceptions, unfortunately, their flowering season soon passes away, and but few blooms are produced until about the time of autumn. The finest white rose ever raised, Frau Karl Druschki, is a hybrid perpetual, and luckily it flowers quite frequently—almost as well as a tea rose. Another excellent free bloomer is Mrs. John Laing, which deserves to be planted in every garden.

Seedlings of tender and half-hardy annuals should be planted out about the garden. The amaranthus, or cockscomb family, has many beautiful members well worth growing, and of these the ornamental-leaved varieties are exceedingly handsome and worth growing. Seeds of petunias should grow well now, and also salpiglossis, balsam, aster, lobelia, godetia, Phlox Drummondii, sunflowers, convolvuluses, nasturtiums, verbenas, and zinnias.

Where the season is good and the soil moist, bouvardias, as well as numerous seedlings which have been raised, may be planted out, but they will need to be looked after, and probably watered and shaded for some time.

Farm Notes.

Hawkesbury District—October.

H. W. POTTS.

The drought has just broken. It was rendered more severe by reason of the prevalence of bleak westerly winds. Frosts have been quite as frequent as last month, and in consequence of these conditions the outlook for the spring and summer is most discouraging.

The hay harvest will be a poor one. In several places the crops, only 10 or 12 inches high, are in flower. This points to the urgent necessity to provide for quickly-growing summer fodder crops.

Maize.—Apart from the main grain crops to put in this month special efforts must be made to such fodder-producing varieties as Improved Early Mastodon, Red Hogan, and Hickory King.

Sorghums.—The main crop of this very useful plant should be got in on well-worked soil. It will be essential to sow in drills 3 feet apart to provide for shallow cultivation later on. We are facing a dry season and it has to be remembered that sorghums will thrive better under such conditions than maize.

Millets.—The growth of millets is now especially indicated to make provision for stock, not only in the summer months, but also to conserve as hay and ensilage for next winter.

The White French variety on a former occasion provided us with a growth of green fodder available sixty-six days after sowing. The millets are hardy, vigorous and quick growers. They will do best on a mellow soil, rich in humus, but respond to good cultivation on a variety of soils. They are best stimulated with farmyard manure. Failing this, a complete artificial manure may be employed. They will give good returns on higher and drier soils than most crops at this juncture. We use 7 lb. of seed to the acre, sown broadcast. Thin seeding possesses one or two objectionable features and ought to be avoided.

The habit of the plant is such as to render it very susceptible to low temperatures and frosts. Where the land is rich and well-tilled considerably less seed will suffice. It will be wise practice to sow every fortnight to provide a continuous supply of green feed through the summer.

Other varieties may be sown with profit, such as Hungarian, Japanese, New Siberian, and Salger's Dakota.

Broom Millet.—The first of three sowings may be made now. Experience has taught us that the early sowings of broom millet turn out the best crops. Continue to sow every two or three weeks.

Sweet Potatoes.—Seize the first opportunity during wet weather to plant out; the young plants will grow better if first soaked in a solution of cow dung.

Cowpeas.—The main object will be to grow cowpeas for fodder. Density and succulence of foliage can be best and most abundantly secured from Warren's New Hybrid, white and clay coloured. This plant is unaffected by heat and flourishes with a minimum of moisture. Should rain fall after

this it will be equally useful in the direction of using for green manure. Last summer during all the trying heat of January and February we grazed sheep on cowpeas with excellent results.

Pumpkins, Marrows, and Squashes.—Every opportunity should be taken to grow these useful plants for fodder. They prove succulent and reliable food for cows, sheep, and pigs during the summer months. Good table pumpkins brought payable returns last season.

Mangolds and Sugar Beet may be sown in the early part of the month.

Field Carrots.—Where a suitable piece of land can be brought into fine tilth a crop of field carrots may be sown to advantage.

Water and Preserving Melons.—In most instances the sale of melons has been met with good returns. They should be sown this month.

Clarence River District—October.

T. WALDEN HANMER.

Farmers on the Clarence River, and in fact, from what we can learn, on all the Northern Rivers, have been suffering from a prolonged spell of dry weather accompanied by strong drying westerly winds and most unusual frosts. During September even, young potatoes have been frost-bitten, and the planting of crops has been very much delayed.

Those farmers who have not already a piece of lucerne land, will be envying their more lucky neighbours who have. The small patches of lucerne are the only green spots to be seen up this way now, and it is really marvellous how even in this dry weather it continues to grow well.

Sugar-cane.—The dry weather of August and September was severe and retarded planting operations very materially, and those who wish to plant afresh will require to make a start as soon as the weather is favourable.

Maize.—In view of the late frosts and dry spell early plantings of maize probably will not be of much account, but October sowings will possibly turn out very well if showery weather prevails.

Sorghum.—October is a very good month to sow either Amber Cane or Planter's Friend.

River or creek frontages will give the best results as the soil is usually deep; the land should be deeply ploughed and thoroughly well pulverised, harrowed and rolled, and lightly harrowed a second time, before the seed is drilled in or sown. If sown in drills, the drills should be 3 feet apart and the seed sown at the rate of about 10 lb. an acre; if broad-cast, sow at the rate of 18 lb. per acre and harrow in. When sown in drills cultivate the land between the drills as long as possible to check the growth of weeds. A very useful and cheap little machine for broadcast seed-sowing may be obtained for about 17s. 6d. This machine enables a man to broadcast easier, quicker, and much more evenly than with his hand.

The various varieties of sorghum are usually considered drought-resisting, and as they make excellent forage and yield well per acre, the dairy-farmer will find them of great value.

Sow also this month broom millet, pumpkins, squashes, melons, grammas, and buckwheat.

A little lucerne may be sown if the weather is moist, although autumn and spring are the best seasons. Bananas and pineapple suckers may be planted this month. Tie up the young shoots of grape-vines to prevent their being broken by the strong winds, and spray with "Bordeaux mixture" occasionally.

Sow French and butter beans, peas, cabbage, lettuce, carrot, parsnips, turnip, and tomatoes.

Those desirous of trying either cotton or tobacco will do well to plant same this month.

Glen Innes District.—October.

R. H. GENNYS.

Potatoes may be sown this month as required; but the main crop is better left till later.

Sorghums, millets, mangolds, beets, cowpeas, lettuce, cabbage, carrots, parsnips, beet, celery, tomatoes, beans, peas, pumpkins, melons, cucumbers, and squashes of all kinds may be planted.

Maize.—This is a good month for planting the main crop here. The danger of late frosts should be past, and no time should be lost on account of the shortness of the season. The early-maturing varieties are likely to do the best in this climate, amongst them being *Iowa Silvermine*, *King Philip* (*Ninety-day*), *Tuscorora*, *Pride of the North*, and *Prairie Queen*. These have all been tried, and have done well in the district.

Select pure seed, if possible, from a suitable variety, and grow only one sort in a paddock, distant not less than half a mile from maize of another description, or seed will probably be much mixed through inoculation. If possible, secure seed from fine well-filled cobs, the grain from the centre of cob being the most even and larger size, and considered the best to plant. A few at the small end in any case better discarded.

Preparing Land for Maize.—The soil should be deeply worked, say to a depth of 6 or 7 inches, and then well worked with the disc or spring-tooth cultivator and harrows.

If *Check-planting*—that is, several grains placed close together and equidistant both ways—furrows can be made with plough across the paddock, intersecting one another at right angles. Three to four grains close together should be planted at the intersection, 3 to 4 feet apart. If the land is well prepared beforehand, this work can be done with the cultivator by removing some of the teeth and putting on attachments for making a small furrow; 2 to 3 inches deep is plenty of cover for grain, especially in a moist climate; it is less likely to rot, and if ground is moist will come up quickly.

Maize is often ploughed in, the sowers following, placing the grain right on the bottom of furrow or about half-way up. I prefer the latter plan very much for a wet climate like New England, as the grain is less likely to rot should wet weather immediately follow planting. The seed can be sown

after the plough, either in single seeds about 16 inches or less apart, or several together 3 or 4 feet apart. The former way is the best. The sod will then be turned over on the grain in the ordinary way, and ploughing continued till the required distance between the rows is worked up, the sowers then planting in the last furrow turned as before.

Sowing Single Grains at 16 inches apart from 3 ft. 6 in. to 4 feet apart in the rows appears to give the best results on clean land ; but in *check-planting* there is the advantage of being able to cultivate both ways and keeping down rubbish.

The land should be harrowed immediately after planting, and where a single furrow only is opened up the grain may be covered in this way. When the plants are a few inches above ground, harrowing will also be found to be beneficial. During growth of crop cultivate frequently. The cultivation should be shallower as the plants grow older so as not to cut or injure the roots. In dry weather cultivate frequently both to check weeds and conserve moisture.

Of course, there are various *Corn Drills* for opening up furrows, dropping seed, and covering up, also some with fertiliser attachment for sowing fertilisers when required.

Prepare land thoroughly for maize, select good seed and suitable varieties, and plant carefully. Strong soils should be chosen for maize-growing.

Riverina District.—October.

G. M. McKeown.

Hay-making.

The chief occupation in this district during this month will be hay-making, which usually commences about the second or third week in the month.

Oats for hay should be allowed to stand till the upper portions of the majority of the heads are showing white, but wheat should be cut at the flowering stage.

The grain of wheat is not readily digested by horses, and it is therefore better to add to wheaten chaff this or such other grain as may be required. It is desirable to boil or scald wheat for horses.

When cut by reaper and binder, the crop should be promptly and carefully stooked. In order to prevent sweating, which often occurs in large stooks, it will be found desirable to limit the number of sheaves in each stook to, at the most, seventeen sheaves, so as to admit of the free passage of air. By thus limiting the number, it is possible to obtain the best colour in the hay, and this property is essential in produce intended for sale in the Sydney market, where it will command the best prices.

Stacking should be carried out as soon as possible after the hay has been properly dried, so that bleaching may be prevented.

The most convenient size for a hay-stack is one having a capacity of about 50 tons. For this the base should be 27 feet x 15 feet, widening gradually until it reaches 18 feet at the eaves.

Crown Lands of New South Wales.

THE following areas will be available for selection on and after the dates mentioned:—

FOR HOMESTEAD SELECTION.

H.S. or S.L. No.	Name of Land District.	Holding, &c.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Annual Rental per Block.	Date available.
			a. r. p.		a. r. p.		£ s. d.	1905.
*983	Narrabri ..	Dobikin ..	.....	1	1,280 0 0	Woolabra, 4 ..	24 0 0	26 Oct.
*982	Narrandera	North Gogeldrie.	.....	1	1,238 2 0	Whitton, 16 ..	14 3 10	19 ,,

FOR SETTLEMENT LEASE.

			a. r. p.		a. r. p.		£ s. d.	1905.
*810	Condobolin	.....	3,784 0 0	2	1,280 0 0 and 2,504 0 0	Condobolin, 7 and 8	14 0 0 and 27 7 10	12 Oct.
811	do ..	.....	7,629 0 0	2	3,201 0 0 and 4,428 0 0	,, 20 to 28	46 13 8 and 55 7 0	12 ,,
*809	Glen Innes..	Glen Elgin and Morven	11,150 0 0	3	3,600 0 0 to 3,850 0 0	Glen Innes, 18 to 22	37 10 0 to 40 2 2	2 Nov.
*812	Narrabri ..	Dobikin ..	.....	1	2,560 0 0	Woolabra, 6 ..	57 12 0	26 Oct.

* Available for original holdings only.

FOR IMPROVEMENT LEASE.

Block Numbers.	Land District or Place of Sale.	Name of Holding.	Total Area.	No. of Blocks.	Area of Blocks.	Distance in Miles from nearest Railway Station or Town.	Upset Annual Rental per Block.	Date of Sale or Tender.
	EASTERN DIVISION.							
			a. r. p.		a. r. p.		£ s. d.	1905. Sale.
603	Cooma	.....	.....	1	1,016 0 0	Jindabyne, 10; Adaminaby, 16; Cooma, 35.	8 0 4	16 Oct.
608	Tamworth..	Tareela and Tareela North.	.....	1	750 0 0	Barraba, 15; Manilla, 35.	6 0 0	16 ,,
	CENTRAL DIVISION.							
1360	Dubbo	Wambangalang.	.....	1	5,370 0 0	Dubbo, 18; Macquarie River, 14.	39 3 2	16 ,,
1344	Narrandera	Kerarbury and Tubbo.	.....	1	1,280 0 0	Darlington Point, 8	42 13 4	16 ,,

FOR CONDITIONAL PURCHASE.

Land District.	Name of Holding, &c.	Total Area.	Parish.	County.	Price per Acre.	Date available.
		a. r. p.			£ s. d.	1905.
Armidale ..	.....	220 0 0	Everett	Hardinge ..	1 0 0	26 Oct.
,, ..	Terrible Vale ..	150 0 0	Sandon and Corgi..	Sandon and Inglis.	1 0 0	26 ,,
Bathurst* ..	.....	400 0 0	Winburn	Roxburgh ..	0 16 8	9 Nov.
Bega	.....	525 0 0	Bermaguee and Murrah.	Dampier ..	1 0 0	23 ,,
Bellingen ..	.....	45 0 0	Buckrabendinni ..	Raleigh ..	1 0 0	26 Oct.
,, * ..	.....	1,100 0 0	North Bellingen ..	,, ..	1 0 0	9 Nov.
Bingara* ..	Bingara	270 0 0	Hall	Murchison ..	1 0 0	26 Oct.
,, ...	Cobbadah	3,519 0 0	Cabbadah	,, ..	1 5 0	26 ,,

FOR CONDITIONAL PURCHASE—*continued.*

Land District.	Name of Holding, &c.	Total Area. a.	r.	p.	Parish.	County.	Price per Acre. £	s.	d.	Date available. 1905.
Boorowa† ..	.....	530	0	0	Binalong	Harden ..	1	15	0	16 Nov.
Braidwood ..	.....	480	0	0	Warri	Murray ..	1	0	0	23 ,,
,, ..	.....	1,150	0	0	Corang and Wog Wog.	St. Vincent ..	1	0	0	23 ,,
Casino * ..	.....	271	2	0	Camira	Richmond ..	1	10	0	26 Oct.
,, * ..	.....	170	0	0	Wyandah	,, ..	1	5	0	2 Nov.
,, * ..	.....	230	0	0	Warragambil ..	Rous ..	1	0	0	2 ,,
,, * ..	.....	730	0	0	Queebun	,, ..	1	0	0	2 ,,
,, * ..	.....	400	0	0	,, ...	,, ..	2	0	0	2 ,,
,, * ..	.....	382	0	0	Langwell	,, ..	3	10	0	2 ,,
,, * ..	.....	6,000	0	0	Poeupa	Buller ..	1	0	0	2 ,,
,, * ..	.....	166	0	0	South Casino ..	Richmond ..	5	0	0	9 ,,
Eden	.....	40	0	0	Cobra	Auckland ..	1	0	0	16 ,,
Glen Innes ..	Within Resumed Area 726.	620	0	0	Yarrow	Gough ..	1	0	0	23 ,,
Gosford	.....	227	0	0	Narara	Northumberland.	0	10	0	12 Oct.
,, ..	.....	269	2	0	Gosford	,, ..	0	13	4	12 ,,
,, ..	.....	113	2	0	Kincumber	,, ..	1	0	0	12 ,,
,, ..	.....	80	0	0	Popran	,, ..	1	0	0	12 ,,
Goulburn ..	.....	440	0	0	Billyrambija ..	Argyle ..	1	0	0	26 ,,
,, ..	.....	300	0	0	Cookbundoon ..	,, ..	1	0	0	16 Nov.
Grafton	.....	50	0	0	Konkadowie ..	Fitzroy ..	1	0	0	23 ,,
Gundagai ..	Wantabadgery ..	240	0	0	Eurongilly	Clarendon ..	2	0	0	26 Oct.
,, ..	Adelong . ..	45	0	0	Enadera	Wynyard ..	0	18	4	5 ,,
,, ..	.....	550	0	0	Mooney Mooney .	Harden ..	1	10	0	2 Nov.
,, ..	.....	350	0	0	Bongongalong ..	,, ..	0	15	0	2 ,,
,, ..	.....	320	0	0	,, ..	,, ..	1	15	0	2 ,,
,, ..	.....	180	0	0	Mooney Mooney ..	,, ..	1	10	0	23 Nov.
,, and Tumut.	Mount Adra and Bangus.	700	0	0	Ellerslie	Wynyard ..	0	10	0	12 Oct.
Gunning ..	.....	290	0	0	Grabben Gullen .	King	1	0	0	9 Nov.
Hay	Gunbar	560	0	0	Beaconsfield ..	Nicholson ..	0	11	8	16 ,,
Lithgow ..	.....	94,000	0	0	Thurat, Alfred, Jenolan, &c.	Westmoreland.	0	13	4	12 Oct.
Milton	.....	60	0	0	Farnham	St. Vincent ..	1	0	0	16 Nov.
Moree	.....	640	0	0	Biniguy	Courallie ..	1	13	4	12 Oct.
Mudgee	.....	4,350	0	0	Goodiman and Tuggoon.	Bligh	0	15	0	23 Nov.
Narrandera ..	Warry (partly) ..	100	0	0	Warri	Bourke ..	0	16	8	5 Oct.
Parkes* .. .	.....	1,015	0	0	Stanley	Kennedy ..	0	16	8	16 Nov.
Rylstone ..	.....	5,500	0	0	Kerrabee and Mount M'Donald.	Phillip ..	0	11	8	5 Oct.
,, ..	.....	34,000	0	0	,, ,, ..	,, ..	0	15	0	5 ,,
,, ..	.....	880, 2,000, & 50,000.			Coggan, Murrumbo, &c.	,, ..	0	15	0	5 ,,
Scone*	.....	1,400	0	0	Omadale	Durham ..	1	5	0	16 Nov.
,, ...	.....	2,500	0	0	,, ...	,, ..	1	5	0	12 Oct.
.. and Muswellbrook.	.....	7,000	0	0	Mackenzie, Werriwa, Wickham, &c	Brisbane ..	1	0	0	9 Nov.
Stroud	.....	800	0	0	Korriga	Gloucester ..	0	10	0	26 Oct.
,, ...	.....	260	0	0	Bullah Delah ..	,, ..	1	0	0	26 ,,
,, ...	.....	890	0	0	Booloombayt ..	,, ..	1	0	0	26 ,,
.. .. ..	.....	400	0	0	Bindera	,, ..	1	0	0	23 Nov.
Taree	.....	400	0	0	Mackay	Macquarie ..	1	0	0	16 ,,
Tenterfield ..	.....	800 and 250			Timbarra	Clive	1	0	0	23 ,,
Tumbarumba ..	Copabella	600, 415, and 640.			Yarara	Goulburn .	0	8	4	5 Oct.
,, ..	,, ...	115 and 280			,, ...	,, ..	0	10	0	5 ,,
,, ..	.....	44	3	0	Goldspink	Wynyard ..	0	6	8	5 ,,
,, .	Ouranee	2,250	0	0	Ouranee & Welaregang.	Selwyn .	0	8	4	5 ,,
Wellington ..	.....	530	0	0	Walters	Wellington ..	1	0	0	23 Nov.
,, * ..	.....	1,280	0	0	Suttor	,, ..	1	5	0	9 ,,

* Available for original holdings only
† Available for original and additional conditional purchase.

SPECIAL AREA.

Casino Land District, 129 acres, in parish Fairymount, county Rous; maximum area, 129 acres; minimum area, 40 acres; price, £2 10s. per acre. Available, 9th November, 1905.

Cooma Land District, 25 acres 3 roods 24 perches, in parish Seymour, county Wallace: maximum area 9 acres 3 roods 16 perches; minimum, 2 acres; price, £4 to £12 per acre. Available for originals only 5th October, 1905.

Rylstone Land District, 411¼ acres, in parish Rylstone, county Roxburgh; maximum area, 227¾ acres minimum, 47¾ acres; price, £1 10s. per acre. Available for originals only, 5th October, 1905.

ROBERT McDONALD,
Acting Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

1906.

Society.	Secretary.	Date.
Albion Park A., H., and I. Society	Henry Tryer ...	Jan. 17, 18
Gosford A. and H. Association	W. E. Kirkness ...	,, 26, 27
Kiama Agricultural Association	Jas. Somerville ...	,, 26, 27
Berry Agricultural Association	A. T. Colley ...	Jan. 31, Feb. 1, 2
Alstonville Agricultural Society	J. C. Foster ...	Feb. 7, 8
Wollongong A., H., and I. Association (Wollongong)	J. A. Beatson ...	,, 8, 9, 10
Moruya A. and P. Society	John Jeffery ...	,, 7, 8
Gunning P., A., and H. Society	Ernest E. Morgan	Mar. 1, 2
Bega A., P., and H. Society	John Underhill ...	,, 7, 8
Walcha P. and A. Association	S. Hargrave ...	,, 7, 8
Tenterfield Intercolonial P., A., and Mining Association	F. W. Hoskin ...	,, 6, 7, 8
Macleay A., H., and I. Association	E. Weeks ...	,, 7, 8, 9
Fair days	....	,, 9, 10
Berrima A., H., and I. Association (Moss Vale)	James Yeo ...	,, 8, 9, 10
Bombala Exhibition Society	W. G. Tweedie ...	,, 13, 14
Camden A., H., and I. Association	A. Thompson ...	,, 14, 15, 16
Newcastle and District A., H., and I. Association...	Owen Gilbert ...	,, 15, 16, 17
Blayney A. and P. Association	H. R. Woolley ...	,, 21, 22
Crookwell A., P., and H. Association	C. T. Clifton ...	,, 22, 23
Tamworth Agricultural Association	J. R. Wood ...	,, 27, 28, 29
Mudgee Agricultural Society	J. M. Cox ...	,, 28, 29, 30
Warialda P. and H. Association	W. B. Geddes ...	April 4, 5, 6
Cooma P. and A. Association	C. J. Walmsley...	,, 4, 5
Richmond River A., H., and P. Association (Casino)	E. J. Robinson ...	,, 5, 6
Hunter River A. and H. Association (West Maitland)	C. J. H. King ...	,, 24, 25, 26, 27, 28
Orange A. and P. Association	W. Tanner ...	,, 25, 26, 27

[3 plates.]

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[ADVERTISEMENT.]

Government Stud Bulls available for lease or for service at State Farms.

Breed.	Name of Bull.	Sire.	Dam.	District where now stationed.	Lease expires.
Shorthorn ...	Royal Duke II..	Oxford's Forest King.	Royal Duchess	Singleton	5 Apl., '06.
,, ...	Dora's Boy ...	Cornish Boy ...	Lady Dora ..	Berry Stud Farm..	*
,, ...	Pansy King ...	Lord Sandgrave.	Pansy IV ...	Wollongbar Exp. Farm.	*
,, ...	Fanny's King ...	Pansy King ...	Fanny ...	Manning River ...	29 Jan., '06.
,, ...	Royalty ..	Royal Duke II..	Plush ...	Grafton Farm ...	*
Jersey ...	Melbourne ...	Woolloomooloo..	Harebell ...	Berry Stud Farm..	*
,, ...	Thessalian II ...	Thessalian ...	Egyptian Princess	Hunter River ...	1 Nov., '05.
,, ...	Colleen's Golden Lad.	Melbourne ...	Colleen ...	Wagga Exp Farm	*
,, ...	Golden Lord ...	Golden King ...	Colleen ...	Singleton	4 May, '06.
Guernsey ...	Calm Prince ..	Rose Prince ...	Gentle ...	Dapto	21 Dec., '05.
,, ...	Gentle Prince ...	Rose Prince ...	Gentle ...	Grafton	4 Nov., '05.
,, ...	Sea King ...	The Admiral ...	Flaxy ...	Lismore	4 Oct., '05.
,, ...	Rose Prince ...	Guess	Rose Blossom	Berry Stud Farm..	*
,, ...	The Admiral ...	Hawkes Bay ...	Vivid (imp.)..	Hastings River ...	6 Feb., '06.
,, ...	Saucy Prince ...	Rose Prince ...	Saucy Sal ...	Tweed River ...	9 Apl., '06.
Red Poll ...	Dairyman ...	Dandy	Turban ...	Berry Stud Farm..	*
Ayrshire ...	Daniel	Sir Thomas ...	Craig... ...	Berry Stud Farm ..	*
,, ...	Don Juan ...	....	.....	H.A.College, Richmond	*
Kerry... ...	Kildare.. ...	Aicme Rex ...	Kitty ...	Berry Stud Farm..	*
,, ...	Gay Knight ...	Prince of Leinster (353).	Pansy II ...	Bathurst Exp. Farm.	*
Dexter Kerry	Waterville Punch.	.....	.....	Grafton Farm ..	*
,, ...	Erebus	.....	.....	Wentworth Falls .	29 Nov., '05.
Holstein ...	President ...	Garfield ...	Nobeltje ...	Wollongbar Exp. Farm.	**
,, ...	Garfield ...	Leo II	Dina II ...	Berry Stud Farm..	*
,, ...	Obbe II ...	Obbe	La Shrapnel...	Camden	3 Dec., '05.

* Available for service only at the Farm where stationed.
** ,, ,, or lease ,, ,, ,,

Regulations under which the Government Stud Bulls are leased.

Department of Mines and Agriculture,
Sydney, 1st July, 1903.

1. Any Agricultural Society, Dairy Farmer, or a combination of Dairy Farmers, may, should the Minister deem it advisable, obtain the hire of one of the Government stud bulls for a period of six months if they guarantee payment for the service of thirty cows, or for shorter periods on special terms.

2. The fee, *which shall be payable in advance*, shall be at the rate of 5s. (five shillings) per cow for all bulls save Dexter-Kerries, and their fee shall be at the rate of 2s. 6d. (two shillings and sixpence) per cow. *Bulls will in no case be forwarded until the fees have been received.*

3. Bulls leased will be transferred free of charge to any place not more than 100 miles by rail from the place from which they are transferred; to any place distant more than 100 miles by rail, lease will be granted only on condition that the lessee pays all charges for the extra distance over 100 miles. In the case of bulls sent by sea, or partly by rail and partly by sea, all expense over the sum of £1 (one pound) must be borne by the lessee. The lessee must make all arrangements for, and bear all expense of, transferring a bull from the nearest railway station or port to the place where it is to be stationed. In the case of leasing a bull already stationed within the district, the new lessee must send for the bull and bear the expense of removal.

4. A condition of the leasing of the bulls shall be that the farming public be allowed to send cows to the bull at a fee of not more than 10s. (ten shillings) per cow, provided the bull's list is not already full, but the total number of cows served must not be more than thirty for six months.

5. Each bull shall be treated and kept in a condition to satisfy the Department, and shall be at all times open to inspection of authorised Officers of the Department.

6. A return showing the number of cows served, and distinguishing between cows owned by those to whom the bull is leased and the outside public, shall be sent to the Department at the end of the term.

7. All due care must be taken to see that the bull shall not have access to cows suffering from any infectious disease, special attention being given to pleuro-pneumonia and tuberculosis.

8. No farmer who is known to have pleuro-pneumonia in his herd shall be permitted to send cows to any of these bulls within three months from the date of the last outbreak.

9. In case of illness of a bull the Department shall be immediately informed.

10. The bull shall not be allowed to run with cows, but shall be kept in a special bull paddock, which must be well fenced, and each cow "in use" shall only be allowed to remain with the bull such time as will enable him to have connection with her twice. However, where necessary, in order to keep bulls quiet, special permission may be given to run with one or two specially-selected healthy cows.

11. Should any of the foregoing rules not be complied with, the Department shall have the right to remove the bulls at once, and all fees paid shall be forfeited.

12. Should a bull be wilfully neglected or badly treated, the Department shall have the right to take any action desirable for the recovery of damages.

13. All applications for bulls should be made to the Director of Agriculture, Department of Agriculture, Sydney.

AGREEMENT CLAUSE.

In consideration of the loan of one Stud Bull ( ) for a period of
I, of do hereby agree to be bound by the conditions expressed
in the foregoing Regulations
Dated this day of 190 .
Witness,— *Lessee.*
J.P.

Duty Stamp.
One Shilling.

N.B.—This agreement must be signed on the day the bull is received by the lessee, and is to be returned by first post to the Director of Agriculture.

PURE-BRED PIGS

FOR SALE.

Newington Asylum, Parramatta River.

BREED.	*AGE.*	*SIRES.*	*DAMS*	*PRICE (each)* £ s. d.
Berkshires	3 months ..	Russell-Swanwick (imp.)	Danesfield Lottie III. (imp.), Joyce (imp.) Jeanette, Queen Betsy, Newington Pride, Rookie, Beauty, Pretty. Jean, Ettie, Miss Swanwick, Sally Russell (from imported stock).	3 3 0
	5 months ..	Ocean Wave (imp.) ...		4 4 0
	6 to 7 months	Gold-Digger (imp.) ...		5 5 0
				Others at prices arranged.
Yorkshire, Large.	do ...	Ruddington Defender (imp.) Sir Wilfred (imp.) ...	Ruddington Countess (imp.), Newington Countess (imp.), Hawke's May (from imp. stock), Hawke's Lass (from imp. stock), Hawke's Flower (from imp. stock). Newington Empress Newington Duchess	do

Rookwood Asylum, Rookwood.

Berkshire	3 months ..	Joe Burbidge (1st prize R. A. Show) by Burbidge (imp.) Jack (1st prize R. A. Show), by Joe, by Maori Chief.	Dumpy, Dumpy 2nd, Bessie, Acme by Boomerang (imp.)	3 3 0
	5 months ..			4 4 0
	6–7 months			5 5 0
Tamworth	do ...	Cholderton Don (imp.) ...	Rolleston Cowslip III. (imp.), and other pure-bred sows.	do
Do ..	do ..	Ginger (1st prize R. A. Show)	..	do

Prices may be arranged for young Sows ready for service.

Liverpool Asylum, Liverpool.

Yorkshire, Large.	3 months ..	Laurier-Jason (imp.) ...	Pure Bred Sows ...	3 3 0
	5 months ..			4 4 0
	6–7 months			5 5 0
Berkshire ...	do ...	Iron Duke, by Wellington (imp.).	do ...	do

Prices quoted are for delivery at the Railway Station or boat nearest to the Asylum.
Ocean Wave, Gold Digger, Cholderton Don, Danesfield Lottie III, and Rolleston Cowslip III, imported this year from best English stock.

Communications should be addressed to the Superintendents of the respective Asylums.

A. W. GREEN,
Acting Director of Government Asylums.

DAIRY BULLS FOR SALE,

AT

WOLLONGBAR EXPERIMENTAL FARM

HOLSTEIN BULL:

Senator; calved, 8th December, 1903.

By President, *ex* Folkye 2nd.

PRICE, £30.

HOLSTEIN BULL;

Vice-President; calved, 25th February, 1904.

By President, *ex* Miss Douwe.

PRICE, £30.

W. S. CAMPBELL,

Director of Agriculture.

FOR SALE

—AT—

Wagga Experimental Farm.

BLACK ORPINGTON - - -	**COCKERELS at 10s.**
BUFF ORPINGTON - - - -	**COCKERELS at 10s.** **PULLETS „ 10s.**
WHITE WYANDOTTE - - -	**PULLETS at 10s.**
RHODE ISLAND RED COCKERELS (for crossing) - - - -	**at 10s.**

Apply, The MANAGER,

Wagga Experimental Farm, Bomen.

PATER
IPSE
COLENDI
HAUD
FACILEM
ESSE
VIAM
VOLUIT